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Economics of livestock-meat industry in Japan

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ECONOMICS OF LIVESTOCK-MEAT INDUSTRY IN JAPAN

by

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I. INTRODUCTION

A. The Role of the Livestock Industry in Japanese Agricultural Economy

The Japanese livestock industry is now important principally as a source of food and secondly as a source of draft power and fertilizer. With the high rate of economic growth, one of the significant developments in Japanese agriculture since World War II has been the expansion of the livestock industry. Before the war, the average expenditure for meat, milk and eggs in 1934-36 amounted to only 1.9 percent of total consumption expenditures, while that for fish and shell fish totaled 3.0 percent, indicating seafood as the predominant item in animal foods. But the predominant position of seafood in animal food consumption expenditure has been taken over in the past period by meat, milk and eggs. This is indicated in the 1966 data when the outlay for meat, milk and eggs amounted to 6.68 percent of total consumption expenditures, while that for fish and shell fish totaled 2.82 percent.

On the other hand, output of livestock products comprises an increasingly larger share of the total agricultural production. In 1955, livestock production constituted only 10.5 percent of the total agricultural production, it had increased to 19 percent in 1966 and probably now constitutes more than 20 percent of the total agricultural production.

The index of total agricultural production in 1965,

when compared to the base year of 1960, is 110.5 while the index number of livestock production in 1965 was 176.2, which is the highest of all product groups.

B. The Objective of the Study

The general purpose of this study is to investigate the development of Japan's livestock industry since World War II and to explore the prospects for the expansion of Japan's livestock industry in future years.

The purpose of this study is, particularly, to find the significant relationships between the consumption and the production of livestock and poultry products brought above by the high rate of economic growth and the great structural changes in Japanese agriculture since the war.

C. Restraints on Japan's Livestock Industry

Before the war, military demands contributed to developing animal husbandry; but after the war, development of the livestock industry has been hindered by a lack of land for the production of feed. As long as per acre planted to rice will yield 6 to 7 times (12) as many calories as the same acre planted to forage or feed grains to be fed to livestock, it is not likely that land suitable for producing food staples will be diverted to the production of livestock.

II. THEORY OF CONSUMER DEMAND

A. Indifference Curve Analysis of Consumer Demand

The indifference curve analysis of consumer demand is based on the concept of ordinal utility[a] and it is a means of clear thinking on problems concerning the behavior and economic welfare of consumers.

1. Definition of an indifference curve

An indifference curve is a locus of points of combinations of goods - each of which yields the same level of total utility. Figure 1 is an indifference diagram. The horizontal axis measures physical units of good X, and the vertical axis measures physical units of good Y. Hence, any point in the field represents a combination of X and Y. Take any point such as A in Figure 1. At the point A, the number of units of X and of Y is shown by the lengths of the lines X and Y. Through point A an indifference curve is drawn and drawn in such a way that any other point on the curve shows quantities of X and of Y that are equally desirable to the consumer. If he could choose among all the combinations of X and Y on the curve, he would be indifferent because all of the combinations leave him at the same level of satisfaction.

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[a]Ordinal utility means that the consumer is assumed to order, or rank, the subjective utilities of goods.

Indifference curves possess the following characteristics: (a) an indifference curve passes through each point in commodity space; (b) indifference curves cannot intersect; and (c) indifference curves are concave from above.

2. Indifference map

So far, only one indifference curve has been described. A complete description of a consumer's tastes for two commodities is provided by the indifference map which corresponds to an entire system of indifference schedules[a]. Since the field in the diagram contains an infinite number of points and since an indifference curve passes through every point, it follows that the number of indifference curve is infinite. Figure 2 shows several indifferent curves.

3. Equlibrium of the consumer

The consumer's budget and the prices of the two goods are represented by the budget line. The slope of the budget line reflects the price of the two goods. The consumer is in equilibrium when he buys the two goods in the quantities defined by the tangency of an indifference curve to the budget line. In equilibrium, the ratio of prices is equal to the marginal rate of substitution. This can be proved as follows:

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[a] An indifference schedule is a list of combinations of two commodities, the list being so arranged that a consumer is indifferent to the combinations, preferring none of them to any of the others.

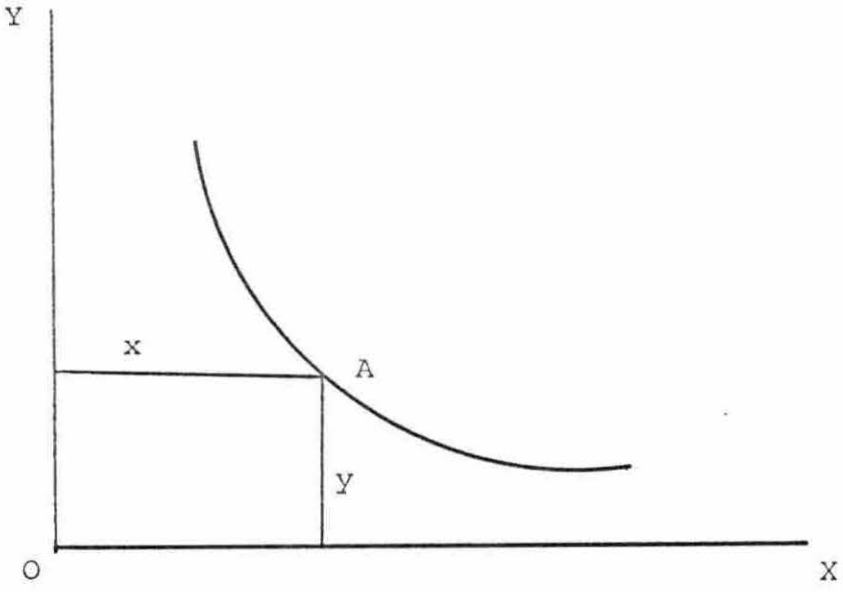

Figure 1. An indifference curve

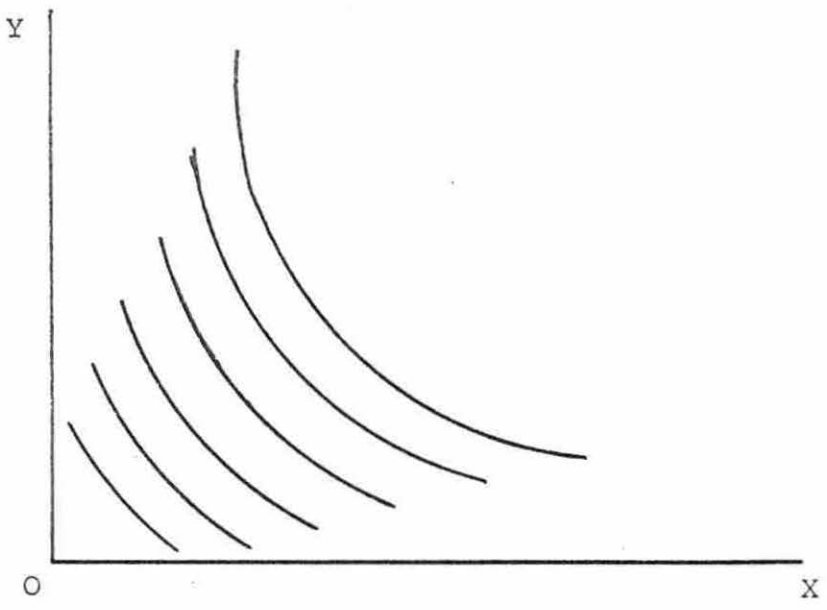

Figure 2. An indifference map

Let there be two goods X and Y with given market prices P_x and P_y. The consumer has a given money income, M, and consumes the two goods in quantities X and Y.

His preference function is given by

$$U = \phi (x, y)$$

His budget constraint is

$$M = xP_x - yP_y$$

Hence, the basic problem is to find values for X and Y that will maximize U and that can be purchased with M.

One method for determining the maximum value of a function of two or more variables subject to functional constraints employs the Lagrangian multiplier technique. Assume that $U = \phi (x, y)$ is to be maximized subject to the constraint $M = xP_x - yP_y$.

From these two functions, form a third function:

$$L = \phi (x, y) - \lambda(xP_x - yP_y - M)$$

Where λ is a Lagrangian multiplier. The first-order conditions require that both partial derivatives equal zero:

$$\frac{\partial L}{\partial x} = \frac{\partial \phi}{\partial x} - \lambda P_x = 0$$

$$\frac{\partial L}{\partial y} = \frac{\partial \phi}{\partial y} - \lambda P_y = 0$$

Transferring the second term to the right-hand side in each equation and dividing the first equation by the second, one obtains

$$\frac{\frac{\partial \phi}{\partial x}}{\frac{\partial \phi}{\partial y}} = \frac{P_x}{P_y}$$

Where $\frac{\partial \phi}{\partial x}$ is the marginal utility of X,

$\frac{\partial \phi}{\partial Y}$ the marginal utility of Y.

This demonstrates that total utility is maximized when the ratio of the marginal utilities is equal to the ratio of the prices.

This is the algebraic condition of the budget line or constraint being tangent to the highest attainable indifference curve and is portrayed geometrically by Figure 3.

$$\text{Slope of the budget constraint} = \frac{\text{Income}}{P_y} \Big/ \frac{\text{Income}}{P_x}$$

$$= \frac{P_x}{P_y}$$

$$\text{Slope of the indifference curve} = \frac{\Delta Y}{\Delta X} = -MRS_{XY}$$

If we move down the indifference curve, $\frac{\Delta Y}{\Delta X}$ says that we give up a little Y in order to gain a little more X. However, we are still on the same indifference curve, so that the loss of utility from a decrease in Y is equal to the gain in utility from an increase in X.

B. Derivation of Demand Curves

The indifference - curve analysis has three explicit variables - the price of a commodity, tastes and income. Two can be held constant while the first is made to change. When the price of a commodity changes, the consumer alters his purchases, provided that his tastes and income remain unchanged.

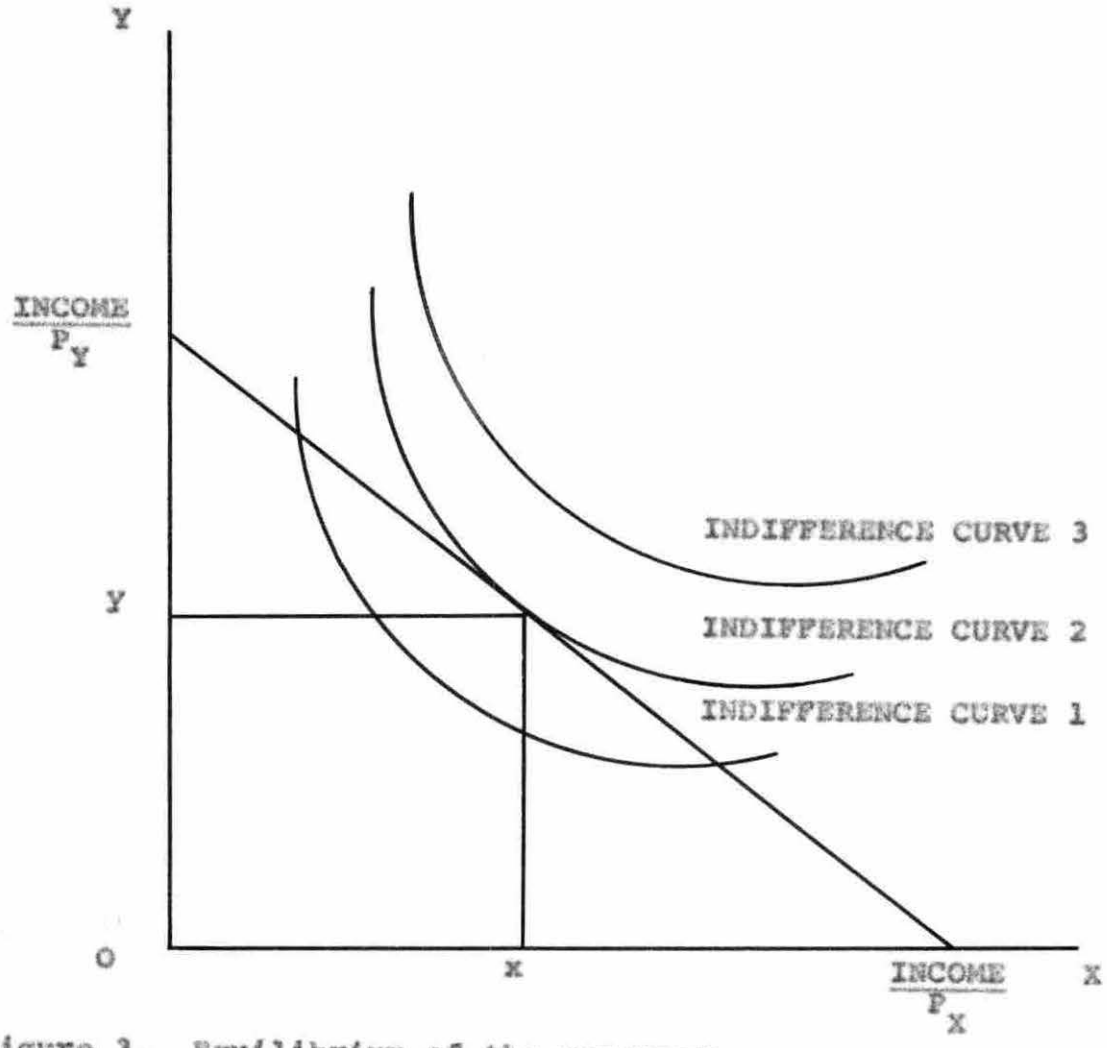

Figure 3. Equilibrium of the consumer

1. Price consumption curve and demand curve

The effects of changes in price can be shown in the upper part of Figure 4. In this Figure, X is a good and Y is money income. Suppose that the consumer is in equilibrium at point A. His budget line is then Y_1X_1, which is touched at A by the indifference curve shown on the diagram. Suppose further that the price of X goes down. To represent this, the foot of the budget line is moved to the right by a distance proportionate to the fall in price. The amount OX_1 is the quantity of X that could be bought at the initial price if the entire budget were spent on X. With a fall in price, the consumer could buy more with his entire budget, namely, the amount OX_2. With another reduction in price, he could buy still more, say, OX_3. Each decrease in price constructs a new budget line - Y_1X_1, Y_1X_3, etc. To each, an indifference curve is tangent at point B, point C, etc. The line drawn through the points of tangency is the price consumption curve. The line shows how the consumption, or purchase, of X varies as its price varies. The price consumption curve, therefore, contains the information from which the consumer's demand curve can be established. The lower part of Figure 4 shows how this can be done. In the lower diagram, the horizontal axis represents quantity. The quantities A, B, and C are marked off. The vertical axis represents price. The prices are found from the upper part by dividing money income by the maximum quantity of X that can be bought. This

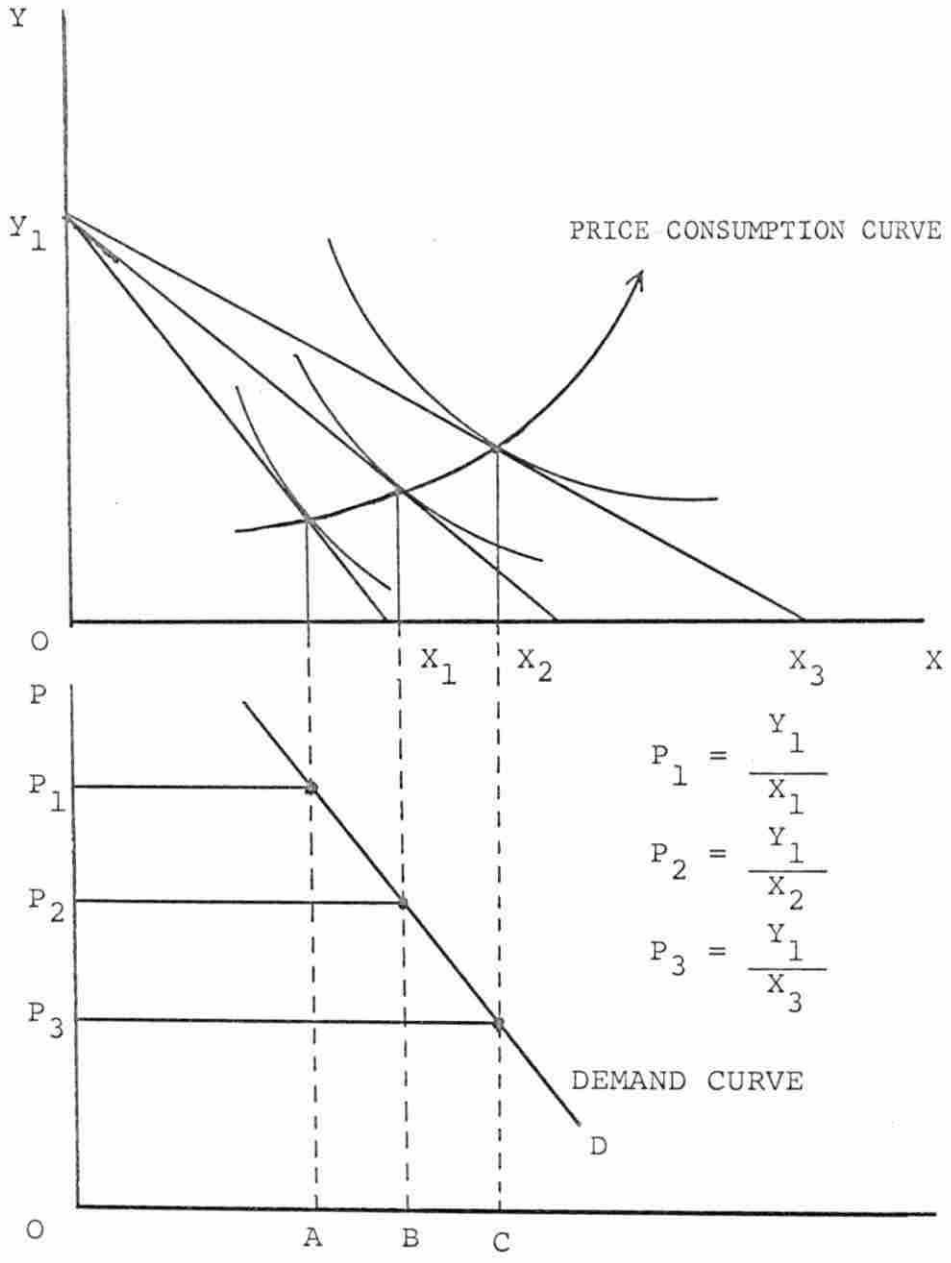

Figure 4. Price consumption curve and demand curve

gives the three prices P_1, P_2 and P_3 in the lower diagram. The three prices and the three quantities A, B, and C give three points on the demand curve D (41)

The form of the demand function depends on how consumers respond to changes in the value of the determinants - price, income, price of related commodities, and tastes. When changes in quantity demanded are proportional to changes in the other determinants, the demand function is linear; when nonproportional, the form is curvilinear.

If income, the prices of related goods, and tastes are all assumed to be constant, the above function can be reduced to the simple form, $Q = f(P)$. But when the other determinants are not constant or when structural changes occur in time, a dynamic function must be used to allow for the changes. Econometrics is the discipline that combines economic and statistical theory for the purpose of measuring actual economic relations. Mathematical models are established on the basis of economic theory. Statistical procedures are utilized to estimate the value of the parameters of the model from empirical data.

The following examples indicate three models commonly used in empirical studies of demand (41).

$$Q = a + bP + CP_p + dY \quad \ldots\ldots\ldots\ldots \quad (1)$$

Where P_p is the related commodity in the model. This linear form was used by Henry L. Schultz in a study of the demand for beef in the period 1922-23 (41).

$$Q = a\, P^b\, P_r^c\, Y^d\, W^e \quad \ldots\ldots\ldots\ldots \quad (2)$$

Where P_r = price of all other goods.

W = an index of the strength of beer which be construed as an index of taste.

This nonlinear form was used by R. Stone to estimate the demand for beer in the United Kingdom for the period 1920-38. (41).

$$Q = aP^b Y^c 10^{f(t)} \quad \ldots\ldots\ldots\ldots (3)$$

Where $f(t) = dt + et^2 + gt^3$ is a function of time. Beatrice Aitchison used this form in a 1941 study of "Demand for Rail Passenger Travel" prepared for the Interstate Commerce Commission.

The letters, a, b, c, d, e, and f in the above three models are the parameters of the functions. A parameter is the value required to cause a function to assume the characteristics that describe an actual relationship. The law of demand causes a demand curve to have a negative slope; exceptions are rare and generally unimportant.

2. Causes of change in demand

A change in demand is a change in an entire demand schedule; it is a shift in a demand curve. Demand curves shift or change because of changes in consumer tastes, in consumer incomes, and in the prices of substitutes and complements. The causes of an increase or decrease in demand can be summarized in the following statement (41).

Increase in Demand	Decrease in Demand
Consumers desire become stronger	Consumers desire become weaker
Consumer incomes rise[a]	Consumer incomes fall[a]
Prices of substitutes rise	Prices of substitutes fall
Prices of complements fall	Prices of complements rise

C. Price elasticity of demand

The coefficient of price elasticity of demand, when $Q = f(P)$, is defined as follows:

$$E_p = \frac{dq}{dp} \quad \frac{P}{q}$$

Where E_p is the coefficient of price elasticity.

For the straight - line demand curve, $Q = a - bP$, the derivative $\frac{dq}{dp}$ is equal to $-b$ and the value of the coefficient of elasticity becomes

$$E_p = -b \frac{P}{q}$$

Since $\frac{dq}{dp} = \frac{\Delta q}{\Delta p}$ when the relationship between q and p is linear, the definition of the coefficient of price elasticity of demand can also be expressed as the ratio of the percentage (or relative) change in quantity to the percentage (or relative) change in price. This can be shown as the following:

$$E_p = \frac{\Delta q}{\Delta p} \cdot \frac{P}{q} = \frac{\Delta q}{q} / \frac{\Delta p}{p}$$

This last definition is correct only for the straight

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[a] Exceptions to this statement are caused by the giffen effect (inferior good).

line.

If the coefficient E_p is greater than one, demand is said to be elastic. If E_p equals one, demand is of unit elasticity. If E_p is less than one, but more than zero, demand is inelastic. If the coefficient is zero, demand is said to be perfectly inelastic. A zero coefficient means that a change in price is not accompanied by any change in quantity.

For the nonlinear demand curve $q = ap^{-b}$, the derivative $\frac{dq}{dp}$ becomes $-abp^{-b-1}$. Then $E_p = -abp^{-b-1} \cdot \frac{p}{q} = \frac{(ap^{-b})(-b)}{q}$

Where $ap^{-b} = q$

Hence $E_p = \frac{q(-b)}{q} = -b$

Thus we know that the exponent of the price variable in a nonlinear demand function is the coefficient of price elasticity of demand.

1. Price elasticity and expenditure

If demand is elastic, a given decrease in price causes a relatively larger increase in the amount bought. From this it follows that a drop in price causes consumers to make a larger money expenditure on a commodity whose demand is elastic. If demand is inelastic, a fall in price causes consumers to spend less money on the commodity. And if demand has unit elasticity, a fall in price causes no change in expenditure.

The relationship between elasticity and expenditure are stated in more general form in Table 1 and also can be easily portrayed through demand curves shown in Figure 5.

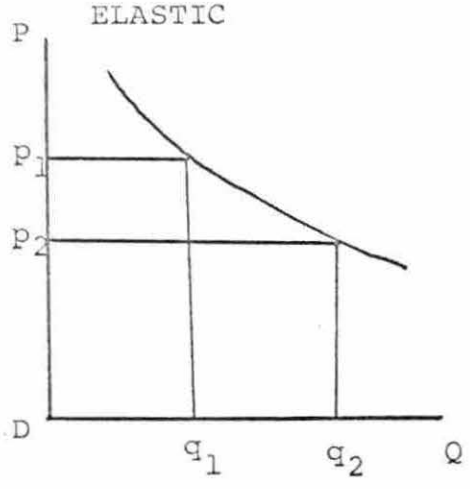
Table 1. Elasticity and expenditure*

	Elastic	Unit Elasticity	Inelastic	Perfectly Inelastic
Value of Coefficient	>1	1	$<1>0$	0
Effect of fall in price	$\frac{\Delta Q}{Q} > \frac{\Delta P}{P}$	$\frac{\Delta Q}{Q} = \frac{\Delta P}{P}$	$\frac{\Delta Q}{Q} < \frac{\Delta P}{P}$	$\Delta Q = 0$
	larger expenditure	constant expenditure	smalller expenditure	fall in expenditure is proportional to fall in price
Effect of rise in price	$\frac{\Delta Q}{Q} > \frac{P}{P}$	$\frac{\Delta Q}{Q} = \frac{\Delta P}{P}$	$\frac{\Delta Q}{Q} < \frac{\Delta P}{P}$	$\Delta Q = 0$
	smaller expenditure	constant expenditure	larger expenditure	rise in expenditure is proportional to rise in price

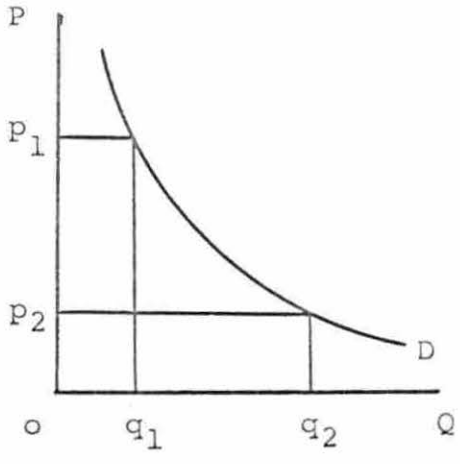
* Source: (41)

Figure 5. Illustration of different elasticities of demand

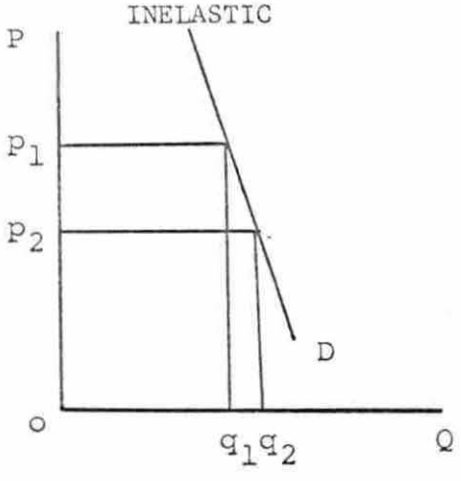
ELASTIC



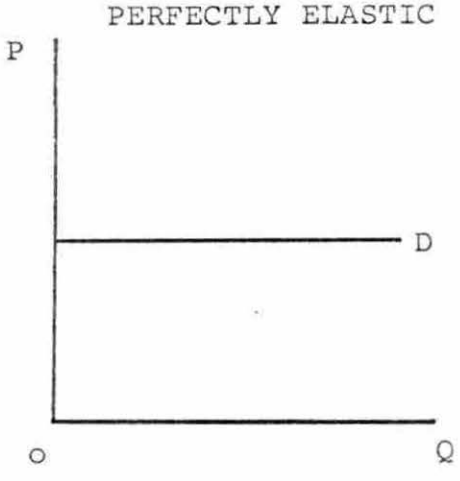
UNIT ELASTICITY



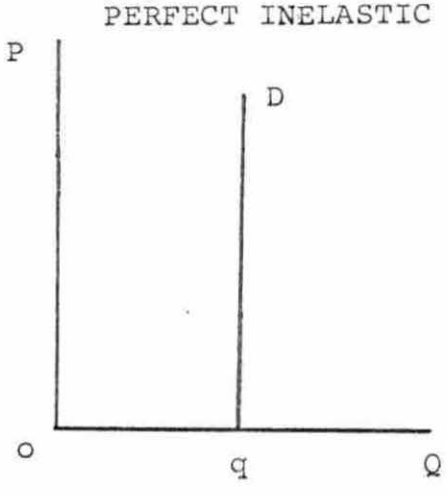
INELASTIC



PERFECTLY ELASTIC



PERFECT INELASTIC



D. Cross Elasticity of Demand

The price cross elasticity of demand is the proportional change in the quantity of X demanded resulting from a given proportional change in the price of the related good Y. The coefficient of cross elasticity, E_{xy}, is defined as

$$E_{xy} = \frac{\frac{dq_x}{q_x}}{\frac{dp_y}{p_y}}$$

or

$$= \frac{dq_x}{dp_y} \cdot \frac{p_y}{q_x}$$

According to the cross elasticity classification, goods X and Y are substitutes or complements according to whether the price cross elasticity of demand is positive or negative. As an example, consider the following: an increase in the price of pork, the price of beef remaining constant, will tend to augment the quantity of beef demanded; E_{xy} is positive and pork and beef are said to be substitute goods. On the other hand, an increase in the price of gin, while the price of vermouth remains constant, will tend to decrease the quantity of vermouth demanded; in this case E_{xy} is negative and gin and vermouth are said to be complementary goods.

E. Engle Curve

The income - consumption curve shown in Figure 6 may be used to derive Engle curves for each commodity.

With money income represented by LM, the consumer comes to equilibrium at point P on indifference curve I,

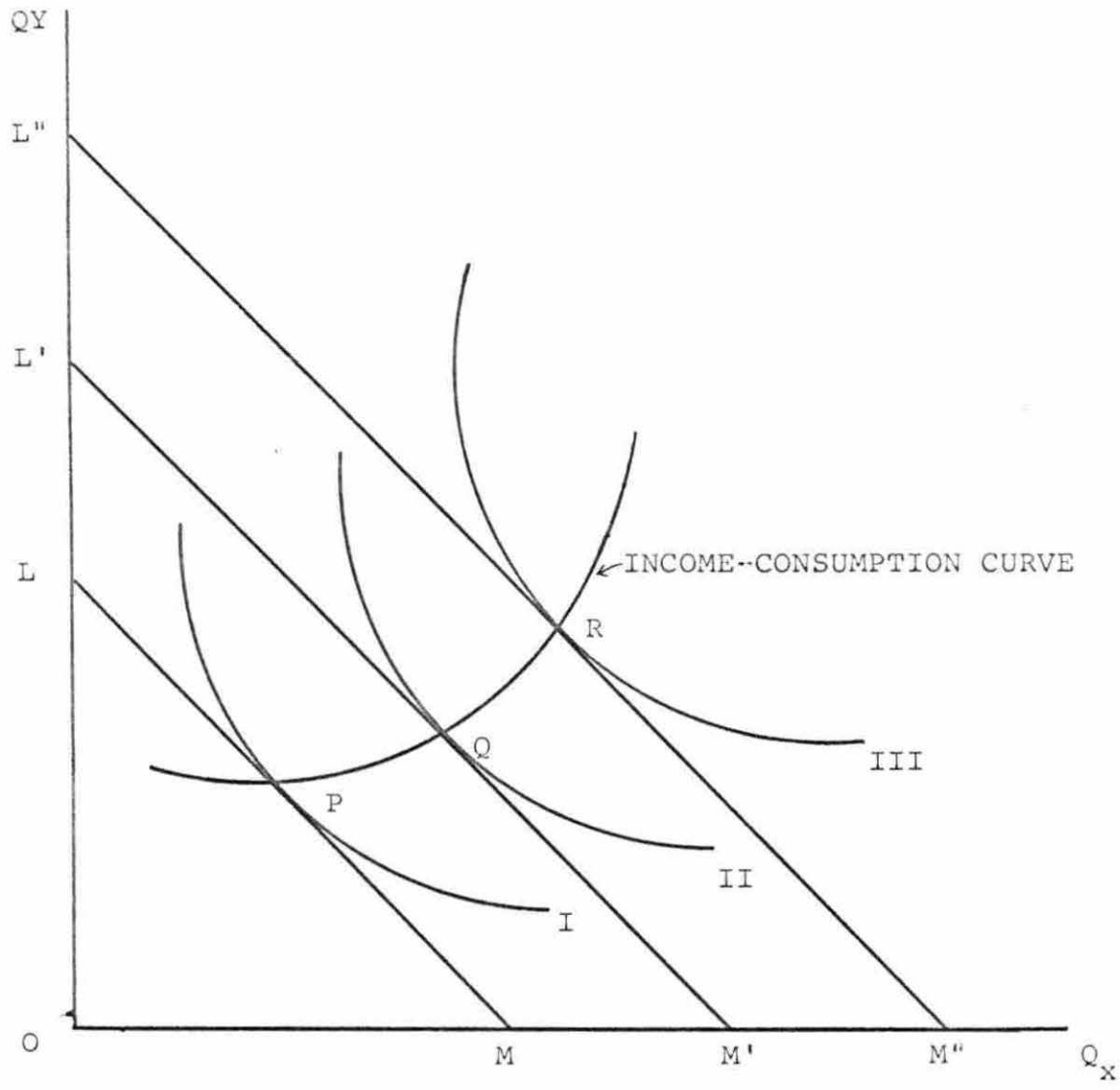


Figure 6. Income-consumption curve

consuming OX_1 units of X. Now let money income rise to the level represented by L'M'. The consumer shifts to a new equilibrium at point Q on indifference curve II. He has clearly gained. He also gains when money income shifts to the level corresponding to L"M". The new equilibrium is at point R on indifference curve III.

As income shifts, the point of consumer equilibrium shifts as well. The line connecting the successive equilibria is called the income - consumption curve. This curve shows the equilibrium combinations of X and Y purchased at various levels of money income, nominal prices remaining constant throughout.

An Engle curve is a function relating the equilibrium quantity purchased of a commodity to the level of money income. Engle curves are important for applied studies of economic welfare and for the analysis of family expenditures patterns.

At the original equilibrium point P in Figure 6, money income is P_X .OM (or P_Y . OL). At the income P_X · OM, OX_1 units of X are purchased. This income - consumption point can be plotted on a graph such as panel (A), Figure 7. When the budget line shifts from LM to L'M' (Figure 6), money income increases to P_X . OM' and consumption to OX_2 units. This income - consumption pair constitutes another point on the Engle curve graph. Repeating this process for all levels of money income generates a series of points on a graph such as panel (A), Figure 7. The

Engle

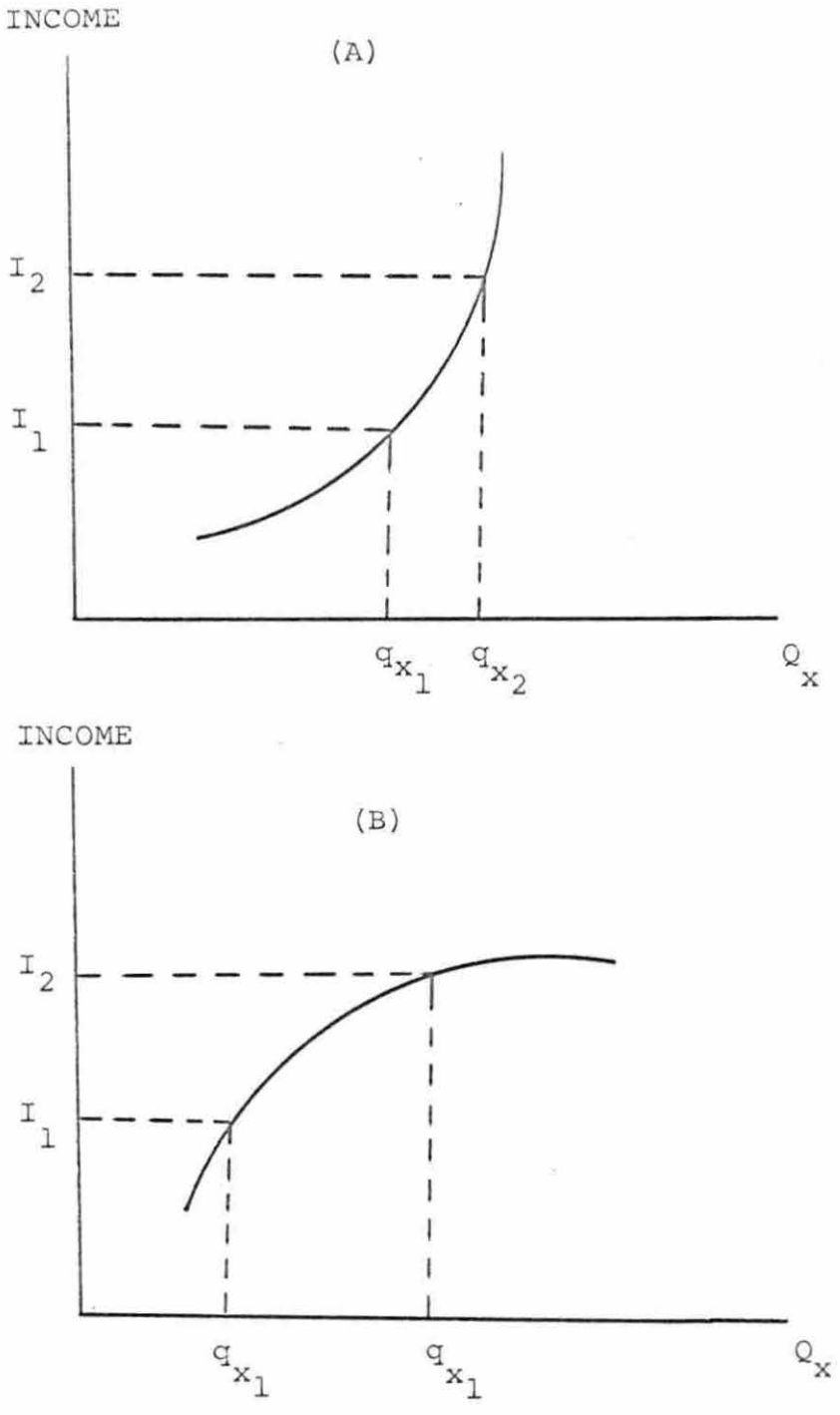


Figure 7. Engel curve

Engel curve is formed by connecting these points by a line.

Two basically different types of Engle curves are shown in panels (A) and (B), Figure 7. In panel (A), the Engle curve slopes upward rather steeply, implying that changes in money income do not have a substantial effect upon consumption. An Engle curve with this property indicates that the good is bought when income is low, but the quantity purchased does not expand rapidly as income increase. In short, an Engle curve that is concave from above indicates a commodity whose income elasticity of demand is low (but positive).

On the other hand, steak and many other types of goods give rise to Engle curves more nearly represented by the curve in panel (B). The relatively gentle upward slope indicates that the quantity bought changes markedly with income. Such a curve indicates a relatively high income elasticity of demand.

F. Income Elasticity of Demand

The purchase level of some commodities may be sensitive to changes in nominal and real money income. Income elasticity of demand is defined as the rate of change of quantity with respect to changes in income, other determinants remaining constant. The linear income - demand function can be written as

$$Q = a + bY \qquad b > 0$$

And this is the equation of an Engle curve with the independent variable on the vertical axis.

$$E_y = \frac{dq}{q} / \frac{dy}{y} = \frac{y}{q} \cdot \frac{dq}{dy}$$

Since the derivative $\frac{dq}{dy}$ is equal to b, the coefficient of income elasticity can also be written as

$$E_y = b \cdot \frac{y}{q}$$

Where E_y stands for the coefficient of income elasticity, Y for income and Q for quantity demanded. For all except inferior goods, the sign of the coefficient is positive, because both income and quantity purchased change in the same direction. The slope of the income-consumption curve gives an indication of income elasticity. The concept of the income-consumption curve is portrayed in Figure 8.

The curve marked high ($E_y > 1$) shows increases in income accompanied by relatively large increases in amounts purchased. The curve marked unity ($E_y = 1$) is drawn at a 45 degree angle so that equal absolute changes in each would signify the same percentage changes. The curve marked low ($E_y < 1$) shows quantity increasing relatively less than income. The curve marked zero ($E_y = 0$) shows that quantity bought is constant regardless of changes in income. The curve marked negative ($E_y > 1$) shows that less is bought at a higher income and that more is bought at lower incomes.

The curvilinear income-demand function with constant elasticity can be written as $Q = ay^b$. The value of E_y is then b

Since $\frac{dq}{dy} = aby^{b-1}$

$$E_y = \frac{dq}{dy} \cdot \frac{y}{q} = aby^{b-1} \cdot \frac{y}{q}$$

$$= aby^{b} \cdot y^{-1} \cdot \frac{y}{q}$$

$$= aby^{b} \cdot \frac{y}{y.q}$$

$$= aby^{b} \cdot \frac{y}{y.ay^{b}}$$

$$= b.$$

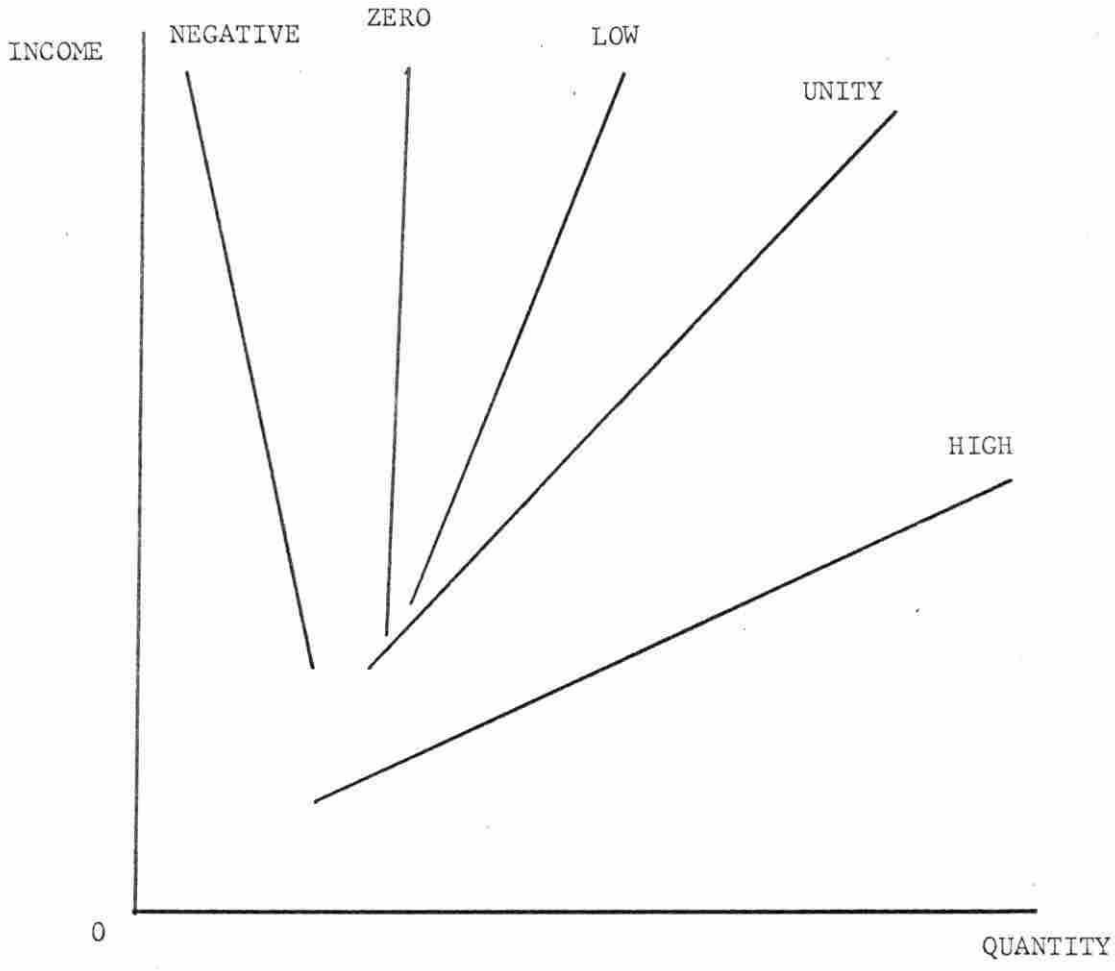


Figure 8. Income elasticities

III. GENERAL OBSERVATIONS ON JAPANESE AGRICULTURE

A. Land Utilization

As a result of the Second World War, Japan lost over one-half of its pre-war territorial possessions (18). Present day Japan consists of four main islands -- Hokkaido (78,509 km^2), Honshu or the Mainland (230,449 km^2), Shikoku (18,758 km^2) and Kyushu (41,947 km^2) -- and over 3,000 minor islands, extending for some 2,600 kilometers off the coast of the Asian Continent in the north Pacific (23), from the 31st parallel north latitude to somewhat above the 45th parallel (20).

Because of such a long stretched out location, Japan has a highly complex and diverse climate. In the northern part of Japan, the temperature is generally low and rainfall is limited. In the southern part, it is rather high in temperature and it rains much in the summer and very little in winter. The rainy season visits the country, except for Hokkaido, from June to July every year; and drizzling rain continues for long periods, it is often followed by torrential rains. Sometimes cool weather damages crops in the northern part, and typhoons and the resultant damage are often unavoidable in the southern part.

Nine-tenths of the agricultural land area is devoted to food crops. By use of multiple cropping, heavy applications of fertilizers, intensive cultivation, improved seeds, and other modern practices, the country achieves high yields per

acre and is 80 percent self-sufficient in food production (35). Nonagricultural land is used extensively for growth of forests.

Agricultural land in Japan is classfied into two major categories. The one is "paddy field," so typical of "Oriental" agriculture; and the other one is "upland field".

The paddy field is the foundation upon which rice cultivation is carried out. The growing season extends in different districts from late spring to the middle of autumn, and water is kept on the fields until nearly the beginning of the harvest season. The management of irrigation water is an essential operation. After rice is harvested, the field is either left fallow until the following season in the single cropping districts or in other districts where the second crop follows after rice, the paddy field is drained and utilized like an upland field until the following rice season. How to combine rice and succeeding other crops is a very important problem for the farmer.

Upland fields are similar to the farmland in Western countries. Irrigation is sometimes practiced on upland fields to moisten the soil, but water is not kept on them as on paddy fields. All other crops (other than paddy rice and second crops of the paddy), including fruit trees, mulberry trees, tea plants and grasses, are cultivated on upland fields. It is available to grow upland rice, though its importance is very minor.

The total land area of Japan is about 36,966,000 hecto-

meters (20), slightly smaller than the state of Calfornia. The chief geographic features of Japan are the abundance of mountains and their rich scenic variety. Japan is a hilly country traversed by northsouth mountain ranges, as if it were a backbone, with numerous lateral branches. It offords only about 6,004,000 hectares, under cultivation which is 16.3 percent of the total land area, and this consists of 3,391,000 hectares of paddy fields and 2,614,000 hectares of upland fields (20). Besides this there are about 291,000 hectares of natural pasture and meadow and 172,000 hectares of forest land used for grazing and mowing (20). The detailed figures from 1960 to 1965 are shown in Table 2.

As is shown in Table 2, paddy fields occupy more than half of the entire arable land. Consequently, rice culture is the core of Japanese agriculture and holds unchallenged importance. Rice accounts for more than half of the value of agricultural production (33).

Wheat and barley, root crops, gardening crops, fruit trees as well as mulberry, animal husbandry and poultry are many of the minor crops challenging the throne. Yet, rice, so far, has maintained an unshaken position. These minor crops have only raised their relative position in the kingdom, going up and down according to the demand; whereas rice cultivation has continued stable throughout the many years.

Table 2. Cultivated land (in 1,000 ha.)*

	1960	1961	1962	1963	1964	1965
Total	6,071	6,086	6,081	6,060	6,042	6,004
Paddy field	3,381	3,388	3,393	3,399	3,392	3,391
Field[a]	3,146	3,152	3,156	3,162	3,156	3,154
Border[b]	236	237	237	236	236	236
Upland field	2,690	2,697	2,688	2,661	2,650	2,614
Normal field[c]	---	2,165	2,132	2,071	2,025	1,949
Orchard[d]	---	451	464	481	502	526
Grass land[e]	---	81	92	109	123	140

[a]Field refers to the place where crops are grown.

[b]Border refers to the place by which field is kept in its effective condition.

[c]Normal field refers to the place where no irrigation system is used.

[d]Orchard field refers to the places where fruit trees, mulberry trees and tea plants are grown.

[e]Grass land refers to the place mainly used for growing grass.

*Source: (20)

B. Number of Farms, the Farming Population and Total Population

As Table 3 clearly shows, the number of farms in Japan, for several decades prior to 1940, remained at about 5.5 million; the farming population (inclusive of a tiny forestry population) during that period held steady at about 14-15 million. The total population had considerably increased and in 1940 was 72,540 million, an increase of 13.1 percent as compared with

1920. These figures increased after World War II but decreased, except for total population, after 1950. However, they are still higher than the prewar levels. One point that should be mentioned here is that all these figures, from 1940 to 1950, indicate a great increase in the farming population, which was mainly due to the immobility of other branches of the national economy to absorb the natural increase of the population (17). It is shown in Table 3 that the number of farms and the farming population in Japan up to 1940 had a strong tendency to remain constant in absolute number.

The increases in 1940-1950 were clearly due to the repatriation of Japan from abroad after defeat, the exodus of urban population into rural areas, and the re-emphasis on agriculture in the Japanese economy because of industrial dilapidation and the food shortage immediately after the war.

The declining trend of the number of farms and the farming population from 1950 to 1965 is due to the following reasons: (a) the decline in the birth rate. (b) Japan's economic growth and expansion have been absorbing a great number of young people from the rural areas into urban areas.

Table 3. Number of farms, farming population and total population*

(unit: millions)

Year	Number of farms	Farming population	Total population
1920	5.57	14.29[a]	55.391
1930	5.51	14.13[a]	63.872
1940	5.39	14.36[a]	72.540[b]
1950	6.18	16.13	83.200
1960	6.06	13.39	93.419
1965	6.04	11.08	98.282

Note: [a]Includes some forestry population

[b]Includes 1,682,500 military personnel of whom 1,000,000 were outside of Japan

* Source: (17; 26; 32)

According to 1965 statistics, total population is about 98 million and agricultural population 30,114,000 or 30.6 percent of the total. The agricultural working population is 15,443,000 or 31 percent of the total working population (20). The detailed figures are shown below in Table 4.

Table 4. Number of households and population*

(Unit: 1,000)

Item	1959	1960	1965
Number of total households[a]	17,960	20,656	24,104
Total population[a]	89,276	93,419	98,282
Number of farm households[b]	6,043	6,057	5,665
Farm household population[b]	36,469	34,546	30,114
Number of working members in farming households	19,423	17,656	15,443

[a] As of October 1

[b] As of February 1

* Source: (20)

C. Recent Developments of Agricultural Production in Japan

During the period of the post-war economic reconstruction, agriculture in Japan made moderate development. Although agricultural production did not fall as much as production of mining and manufacturing following the war, it still had gone down. By 1954 it was only 60 percent of the prewar (1934-1936) level (29). But it recovered comparatively quickly; it regained the prewar level roughly in 1951 and exceeded it by about 6 percent in 1954 (29). The development of agricultural production since 1954 is diagrammed in Figure 9.

In comparison to the development of crop production, livestock raising (with the exception of draft-animals, horses

(Base: 1957-59 = 100)

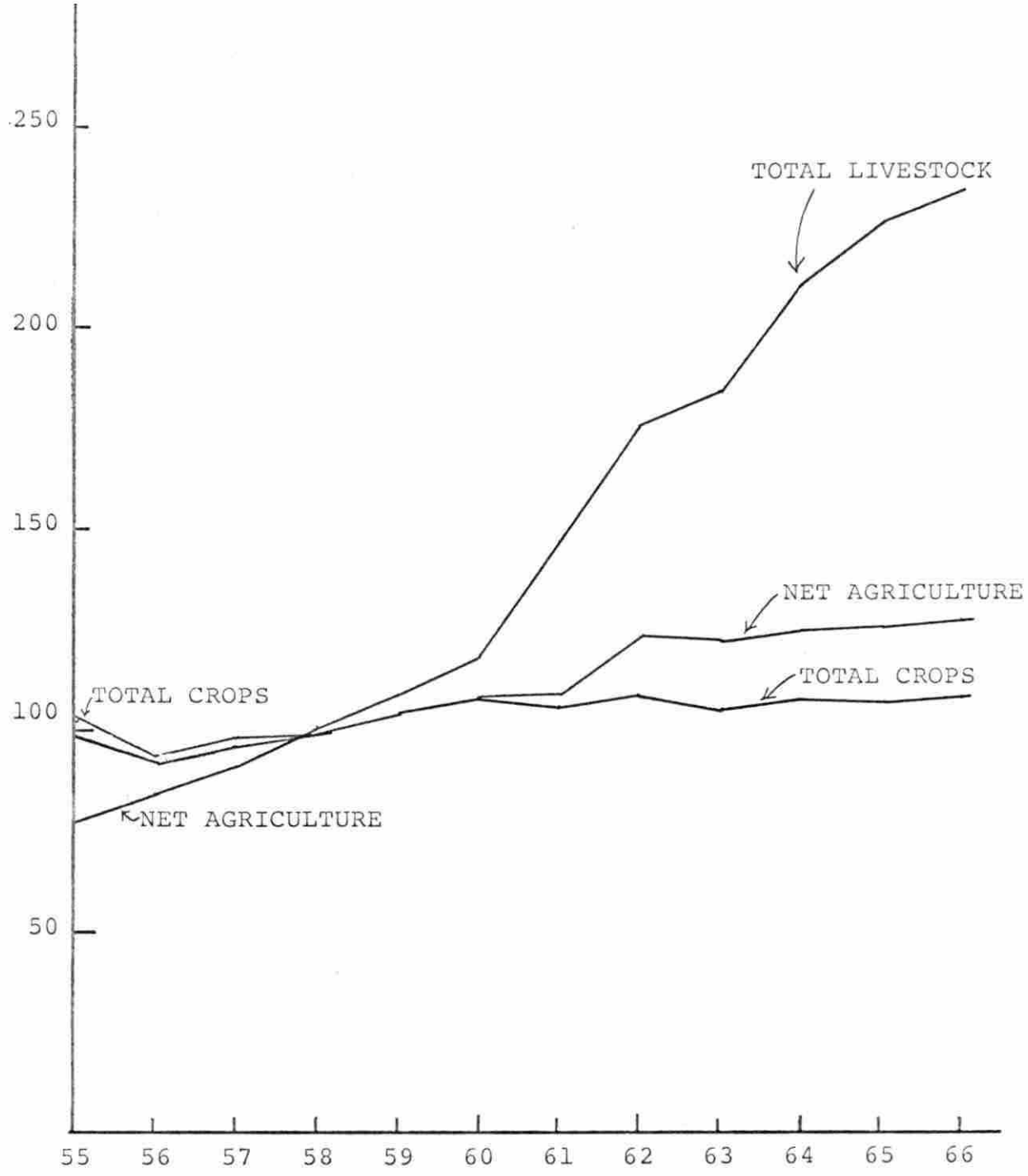


Figure 9. Development of agricultural production (41)

in particular) continued to grow rapidly. Although it suffered a serious slow during the war, it began to recover quickly about 1948. By 1954 it reached a level about twice as high as the prewar record (29). It is shown in Diagram I and Table 5 (the index number of agricultural production) that some products expanded remarkably in production after the war -- fruits, vegetables and livestock products in particular. On the contrary, a drastic decline was marked in cocoons in spite of its important position in agricultural production during the prewar period.

The index number of total agricultural production in 1964 as compared to the base year of 1960 was 110.5. For livestock products, the index number is 160.1 and that of pork production is 187.4.

The expansion in egg and poultry production is remarkably high. Although the index number for cocoon production from 1960 to 1964 shows a strong tendency to remain constant, the production of cocoons fell about 30 percent from prewar levels in 1954 (29). One product in Japan that retained a level of about 50 percent of the total output of the prewar and post-war years is rice (20).

The increase in agricultural production in the post-war period has been achieved through land reform[a], extensive soil improvements, developments in technical efficiency of agriculture, increase of the imports of feedstuffs from abroad, more government funds invested or loaned to agriculture after 1950, the increase of industrial production (the develop-

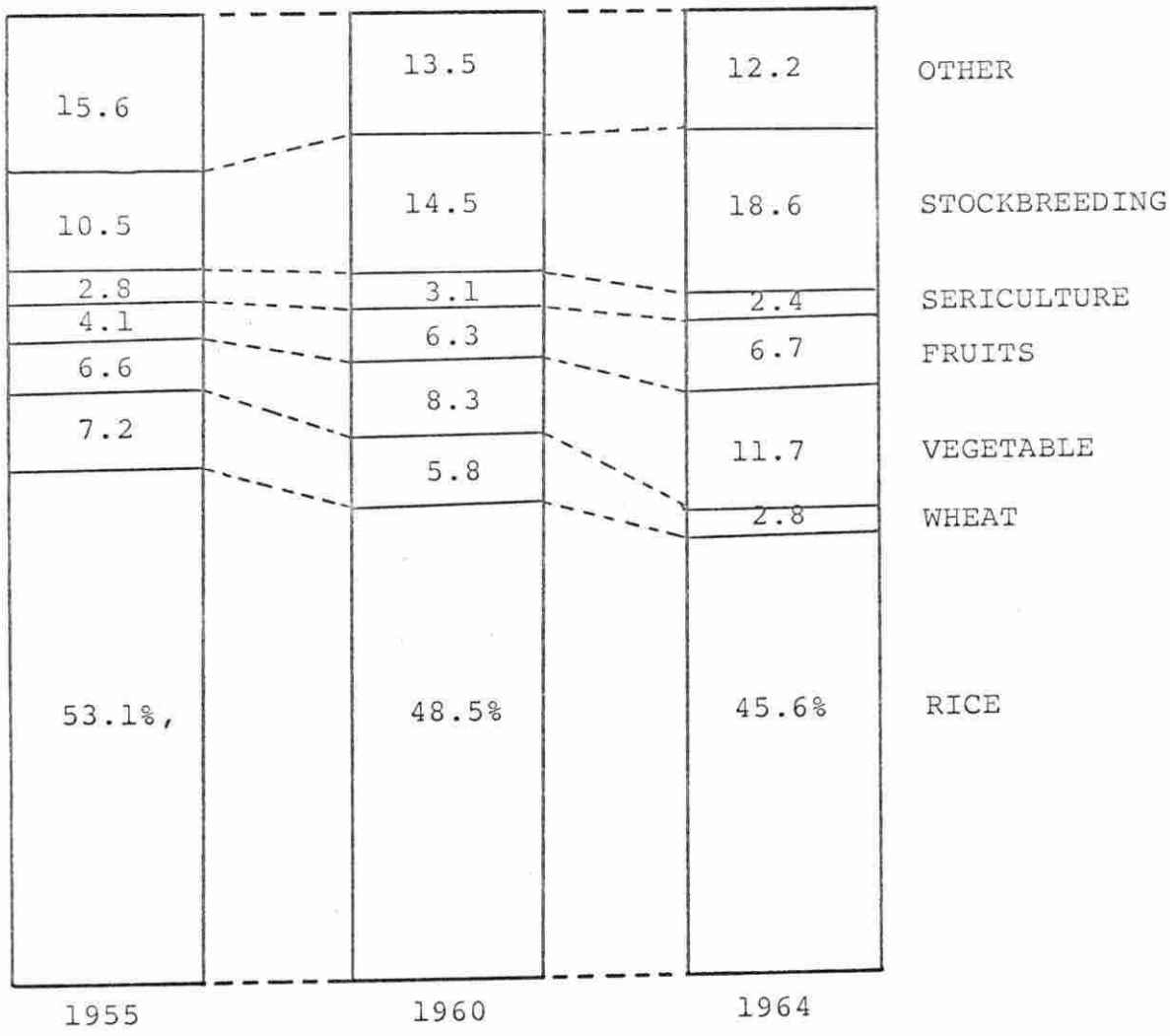


Diagram 1. Component ratio of agricultural production (26)

Table 5. The index of agricultural production in Japan *

(Base: 1960 = 100)

Item	1955	1960	1961	1962	1964	1965
Total Agriculture	90.4	100.00	102.5	107.4	105.2	110.5
Crops	93.7	100.00	97.5	100.4	96.2	99.0
Rice	96.3	100.00	96.6	101.6	100.0	98.1
Wheat and Barley	109.1	100.00	95.5	84.6	30.1	65.0
Vegetables	81.0	100.00	98.1	105.6	112.4	111.3
Fruits	57.8	100.00	102.3	103.3	106.2	117.8
Industrial Crops	100.7	100.00	105.7	110.0	105.9	132.0
Cocoon	101.5	100.00	103.6	98.2	99.8	100.6
Livestock and its Products	70.1	100.00	128.7	148.3	155.6	176.2
Dairy Cattle	55.3	100.00	111.9	125.0	137.0	142.6
Beef Cattle	112.4	100.00	112.7	113.1	131.8	155.2
Swine	57.6	100.00	146.7	184.8	172.0	187.4
Poultry	-----	100.00	130.0	161.7	190.1	235.9
Milk	53.0	100.00	112.0	129.1	146.3	160.1
Eggs	70.8	100.00	135.2	153.7	160.4	187.5

* Source: (20)

1955

ment of agricultural production and the advance of techniques were preceded, and perhaps reflected, the post-war expansion of industrial production) and an increase and change in the demand for agricultural products.

D. Recent Agricultural Policy and Goals

Japanese agriculture is closely inter-related with the industrial and commercial sector of the economy. The Japanese government has been striving for further improvements in the means of production. It has been apparent for a long time that the only lasting solution to the problem of too many farmers on a limited land area and the resulting low income is to have industry and commerce absorb extra labor from the overcrowded farm sector. Smoothing the transition from an agricultural to an industrial society is a major goal of the Japanese government.

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[a]First, land reform meant reform of the rural society, which it democratized and enlivened. At the same time, leadership in the rural areas shifted from the conservative elders to the progressive young people. As a result, many new techniques have been introduced, and many village development projects have launched.

Second, land reform meant the redistribution of property and income. It enriched the farmers and elevated them to the higher income brackets. They have now become potential investors.

Third, land reform meant increased marketing activities among the farmers. Land reform abolished the system of payment-in-kind for the rent, and all farmers now sell their rice directly to the buyers. This gives rise to the farmers' direct concern about the market economy.

According to recent data, there are about 6 million farms in Japan, the average size of which is a little less than one hectare (2.47) acres) (29). Ninety percent of the farms are cultivated by individual owners. Agriculture accounts for less than 10 percent of the GNP (29), although one-third of the people live on farms. This points out the fact that farm people are not sharing equally in the growing prosperity of the country. For this reason, Japan's recent broad economic objective is to achieve a continued increase in the total per capital production and consumption of goods and services, with maximum opportunity for full employment. On the other hand, Japan's agricultural policies currently emphasize the government's desire to make more nearly equal the economic condition of Japanese farmers and industrial workers. Temporary price supports and subsidies are now in use. Possible gains in efficiency of production are sought through consolidation of small farm units to permit farming on a large scale. It is without doubt that expanding foreign trade is a key factor in national prosperity.

E. Recent Price Regulations and Internal Markets in Japanese Agricultural Products

The Japanese government conducts an extensive price-support and price-stabilization program in both the production and marketing of farm products. After land reform, the largest change in Japanese agriculture is the agriculture control system. Production of farm products, controlled by the Staple

Food Control System and similar price control systems, reaches 70 percent of the total farm production (32). The products under control are rice, wheat, barley, oats, soybeans, sweet and white potatoes, rapeseeds, sugar beets, silk cocoons, and tobacco.

Official prices paid to producers who produce rice are set each year. All rice offered for sale by producers is subject to purchase by the Food Agency through licensed handlers. It is sold to consumers under ration at fixed prices through licensed dealers.

Wheat and barley are handled a little differently. The Food Agency of the Ministry of Agriculture is authorized under the Food Control Law to purchase wheat and barley from producers in such unlimited amounts that they may wish to deliver at prices fixed by the government. The Agency has exclusive control over imports and sells wheat and barley to millers at fixed wholesale prices. On imported grains the government reaps a profit that helps to offset support costs.

Japanese laws provide also for price supports for soybeans, potatoes, rapeseed, sugar beets, raw silk and leaf tobacco. In November 1961, a livestock price-stabilization law became effective. Livestock products began to come under price control with the establishment of the livestock products supply-demand stabilization system. The purpose of a livestock price-stabilization law was to stabilize the market for livestock products by purchasing, storing and reselling. The enactment of new price-support programs as Japan proposes to liberalize trade reflects

the government's strong interest in promoting the expansion of the livestock industry.

Furthermore, a crop insurance system is now playing an important role in insuring farmers' income against extreme decreases in agricultural production due to bad weather, harmful insects and other disasters. The livestock insurance system protects the farmers from severe losses from livestock epidemics.

F. Technological Progress in Japanese Agriculture

After the Second World War, one of the largest changes in Japan's agriculture was the large-scale technological progress. This is probably partly the development of technical progress that had already burgeoned in the prewar days and obtained a new impetus with the recovery from the postwar adjustment problem. For example, the introduction of the power thresher is the renewal of the prewar trend. The mechanization of field operations may also be regarded as a reopening of a prewar trend. However, post-war technological progress has been remarkable on the strength of: (a) the intensive agricultural scientific research stimulated by the food shortage during the war and after the war; and (b) the adaptation into agriculture of many technical innovations in non-agricultural fields. In particular, labor-economizing techniques have made a great advance. From 1955 to 1964, the number of power cultivators increased by 18.3 times to reach 1,220 thousand (19; 29).

The improvement of land productivity was also promoted by

technical advance. As a result, the index number of land productivity in fiscal 1964 showed 112.6 with 1957 taken as the base year, according to the Agricultural-Forestry Ministry's "Farm Household Survey." (19). Fertilizer consumption per ten acres increased greatly during the 1952-1960 period; it increased 1.7-fold nitrogen, 2-fold in phosphate, 4.3-fold in potassium (29). A sharp increase in the use of potassium is considered to have contributed greatly to improve the effect of fertilizer. The consumption of agricultural chemicals also increased greatly. Furthermore, notable improvements in cultivating techniques have been made. Some of the examples are the more common practice of early planting, more intensive application of fertilizer, economizing of ploughing labor, simultaneous prevention of blight and insect damage, etc.

IV. ECONOMIC GROWTH AND STRUCTURAL CHANGE IN JAPANESE AGRICULTURE

A. High Rate of Economic Growth and an Unbalanced Development of Agriculture and Industry

Since the end of the Korean War the Japanese economy has entered a new stage of development. The tempo of Japanese economic growth since 1955 has been remarkable and the growth of real national income during these years has grown an average rate of close to 10 percent (31), the highest rate for any major country in the world (see Table 6). Such a high rate of economic growth was accompanied by notable changes in both the industrial and agricultural structure.

Table 7 shows that Japan's rapid economic advance has been in the years since the end of the Korean War: Between 1953 and 1965 real gross national product increased by an average of about 9% per annum.

No one denies that the recovery factors of Japan's economy since World War II may be attributed to the Korean War, American aid, off-shore procurement, and other special causes such as the demographic change which has resulted in an exceptionally high working population.

The high rate of economic growth has absorbed more of the population into the industrial sector and has caused a tighter supply of labor. This kind of situation has affected the smaller business and wage differences of the various sizes of enterprises have considerably narrowed. Nevertheless, the dual character of Japan's industrial structure has hardly been weakened.

The duality in Japan's economic structure is more clear in the relation between the agriculture and industrial sector. The relative importance of agriculture has declined and the gaps between agriculture and industry with respect to productivity and living standards have clearly widened. The share of agricultural income in the national income, which was 17.9 percent (29) in 1955, has declined to nearly 10 percent (35), a figure even below that of the pre-war years. This points up the fact that the so-called dual structure of Japan's economy, that is, the mixture of large enterprises with high productivity on the one hand and the small and petty-sized enterprises and farms with low productivity on the other. For instance, in 1953, the income of a worker in primary industry (agriculture, forestry and fisheries) was no more than 40 percent of the income of a worker in secondary (manufacturing, mining and construction) industry (40). The gap between the standards of living of urban working people and farmers is large. For instance, the per capita household expenditures of an average farmer in 1960 were estimated at between 60 to 80 percent of the corresponding expenditures of the urban working people.

The comparison between agriculture and manufacturing industries in respect to the real national income per employed person, as made in Table 8, shows that the share of the farmer has generally continued to decline. In 1960 it registered the lowest mark in the postwar period.

It is without a doubt that the agricultural productivity

and farmer's living standards have been raised under the influence of a rapidly growing economy, and yet have tended to lag further behind those achieved in the non-agricultural sector. In other words, the imbalance between the agricultural and industrial sector in their respective growth has become even more marked under the high growth rate economy of Japan.

Table 6. International comparison of rate of growth trend *

1955-1963	Rate of growth trend (actual)
Japan	10.2%
Taiwan, China	7.0
Italy	6.3
Greece (1955-1962)	6.0
West Germany	5.8
Denmark	5.2
Portugal (1955-1962)	5.1
Austria	4.6
Switzerland	4.6
Sweden (1958-1962)	4.5
Korea	4.5
France	4.1
The Netherlands	4.0
Norway	3.7
Canada	3.2
U.S.A.	2.9
Belgium	2.9
U.K.	2.8

* Source: (11; 19)

Table 7: Annual growth rates of real gross national product in Japan*

1953-1966 (%)

Fiscal year	Annual growth rate
1953-1954	6.7
1954-1955	3.3
1955-1956	10.3
1956-1957	9.0
1957-1958	7.9
1958-1959	3.2
1959-1960	17.9
1960-1961	13.3
1961-1962	14.0
1962-1963	5.9
1963-1964	12.3
1964-1965	3.5
1965-1966	9.0

*Source: (27; 30)

Table 8: Real national income per capita of working population*

(In thousand yen)[a]

Year	Agriculture (A)	Manufacturing Industries (B)	(A)/(B) (%)
Average of 1934-1936	57.8	212.4	27.2
1949	52.9	159.7	33.1
1950	62.4	194.6	32.1
1951	67.5	207.6	32.5
1952	68.9	201.5	34.2
1953	61.0	214.5	28.4
1954	64.9	212.3	30.6
1955	76.9	222.6	34.5
1956	68.9	254.1	27.0
1957	71.5	255.5	28.0
1958	78.5	255.4	30.7
1959	83.5	310.4	26.9
1960	87.3	366.9	23.8

Notice: Based on the 1958 prices; aggregate deflators of national income were used in common.

[a] The conversion from Japanese yen to United States dollars was made by using 360 yen = one dollar.

Source: (29)

B. The Development of Commercial Agriculture in Japan

Just as the Japanese economy entered into a new stage in its growth since the end of the Korean War (1955), so did agriculture take a new turn of development after that war. Each of the indices of total agricultural production in 1955 and 1964, as compared to the base year of 1960, shows respectively 110.5 and 90.4 (20) and its average annual growth rate was 2.2 percent during the period from 1955 to 1964. The rate of commercialization of agricultural products rose from 62 percent in 1952 to 78.9 percent in 1965 (5; 28). Rice still topped the list of commercial products with its share of 39.6 percent (28) in 1952 and 66 percent in 1965 (21).

The rate of commercialization of agricultural product and component of agricultural products are shown in Table 9.

Table 9. The Rate of commercialization of agricultural products and components of agricultural products, 1961-1965*

	1961	1962	1963	1964	1965
Agricultural products	74.7	76.0	76.3	77.5	78.9
Rice	63	62	64	65	66
Wheat	63	66	65	60	69
Sweet potatoes	60	59	64	71	71
Potatoes	48	52	46	47	55
Soybeans	46	49	48	47	45
Milk	96	96	96	97	94
Eggs	81	81	83	85	86

*Source: (21; 25)

One of the notable characteristics of the development of agricultural production since 1955 is that with the increased commercialization of agriculture, productivity has been raised remarkably. It is shown in Table 10 that the productivity of land continued to rise, while the productivity of labor, which had slowed until 1954, began to take an upturn after 1955; now its productivity index exceeds the land productivity index.

C. Changes in the Structure of Japanese Agriculture

With the growing commercialization of agriculture, let us look at what developments have taken place in the structure of agriculture.

1. Decline in the relative importance of sericulture[a]

One of the most important changes in Japanese agriculture since 1920 has been a drastic decline in the relative importance of sericultural productivity. Sericulture in 1920 was a most important source of secondary employment for the farm population accounting for over 15 percent of the value of total agriculture production (18). Raw silk was the most important single source of export earnings for the Japanese economy until the collapse of the American market, its principal outlet in the early 1930's. A drastic decline in the relative importance of sericulture since 1926 to 1959 is readily seen in Table 11.

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[a]The rearing of silkworms.

Table 10. Changes in labor productivity and land productivity* (Base: 1950-1952 = 100)

	Index of labor productivity	Index of land productivity
1951	99.7	97.7
1952	108.1	106.8
1953	90.3	92.8
1954	100.7	100.8
1955	121.1	117.6
1956	116.5	109.9
1957	123.6	115.2
1958	134.7	120.5
1959	141.8	124.4
1960	147.5	127.1
1961	155.3	129.4
1962	167.0	135.2
1963	171.2	131.9
1964	185.4	137.9
1965	194.1	140.2

Note: The labor productivity index represents the productivity index divided by farm working population index, the land productivity index is derived from productivity index divided by planted acreage index.

*Source: (25; 29)

Table 11. Value of output of principal agricultural products as a percentage of the value of total agricultural output of Japan, 1926-- 1959 *

Product	1926	1931	1936	1955[a]	1957[a]	1959[a]
Rice	49	46	53	55	51	53
Cocoons	17	14	11	3	3	3
Wheat, barley & oats	8	8	9	9	6	8
Vegetables	7	8	7	6	7	8
Beans, potatoes & cereals	6	6	6	9	8	8

[a]Fiscal years

*Source: (18)

2. Change in demand for agricultural products

Along with the rapid growth in the Japanese economy have come great changes that touch the life of every Japanese citizen. Some of these changes has a strong influence in shaping Japan's shopping list in the world markets.

When Japan's dietary life had recovered the prewar levels around 1954, the rate of increase in food demand has generally been on the decline. As shown in Table 12, of the increased portion of per capita disposable income, the ratio of expenditures for food and drinks (marginal propensity to consume) stood at 45.7 percent in 1951 but it came down to 17.8 percent in 1964 (17).

At the same time, there has been a big change in the structure of the food demand of the nation. As shown in Table 13,

food balance for the recent years shows the changes that are taking place. The Japanese are eating more fruits, milk, vegetables, meat, eggs and fats. As this shift takes place, demand for some other foods is declining. Also notable has been the increased used of processed foodstuffs as well as the increasing habit of eating out.

Table 12. Change in gross food expenditure (In thousand million yen)*

Year	Disposable personal income (A)	Personal consumption expenditure (B)	Expenses on food and drinks (C)	$\frac{C}{A}$	$\frac{\triangle C}{\triangle A}$
1951	3,729	3,018	1,806	48.5	--
1952	4,358	3,679	2,094	48.1	45.7
1953	4,865	4,351	2,411	49.6	62.6
1954	5,288	4,740	2,611	49.4	47.1
1955	5,941	5,118	2,703	45.5	14.1
1956	6,468	5,501	2,899	44.8	37.2
1957	7,058	5,980	3,056	43.3	26.7
1958	7,450	6,294	3,179	42.7	31.2
1959	8,425	6,882	3,324	39.5	14.9
1960	9,723	7,702	3,583	36.9	20.0
1961	11,434	8,917	4,017	35.1	25.4
1962	12,910	10,242	4,459	34.5	29.9
1963	14,914	11,823	5,087	34.1	31.3
1964	17,052	13,437	5,644	33.1	17.8
1965	21,288	17,354	6,732	31.6	--

* Source: (19; 29)

Table 13. Per capita consumption of selected principal food products, average 1934-1938, annual 1955-1965*

Period	Average 1934-1938	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
	Unit: Kilogram[a]											
Rice	134.0	105.3	107.1	115.8	112.8	113.0	114.3	116.5	117.2	116.3	114.7	110.5
Wheat	9.7	25.1	23.9	24.8	24.1	25.8	25.8	25.8	26.0	26.9	28.1	29.0
Barley	12.7	9.2	9.2	9.2	8.6	6.8	3.9	2.8	2.5	2.3	2.7	2.0
Potatoes	54.7	48.7	44.5	43.1	41.9	37.4	34.0	33.0	28.9	25.8	25.9	23.7
Meat	3.8	3.3	3.6	4.2	4.6	4.8	4.8	6.1	7.8	7.8	8.4	9.0
Eggs	2.9	3.4	3.4	3.8	3.9	4.0	4.8	6.5	6.7	7.4	8.6	8.8
Milk & milk prod.	4.5	12.0	14.1	16.5	17.8	19.8	25.6	25.5	30.4	35.8	37.3	36.3
Sugar	14.4	12.3	12.7	12.7	13.8	14.2	14.9	15.7	16.7	16.5	17.3	18.4
Vegetables	79.2	67.9	70.0	89.4	72.5	74.6	86.3	84.5	95.9	103.1	100.4	106.1
Fruits	16.4	14.6	19.3	20.2	21.1	22.6	25.3	27.3	26.1	29.3	32.5	32.7
Fish & shellfish	35.3	20.1	18.9	22.9	21.8	22.7	23.4	28.6	27.2	27.8	24.8	27.7
Fats & oils	1.9	2.7	3.0	3.2	3.4	3.8	4.3	4.7	5.3	6.2	6.7	6.9
Total calories[b]	2,175	2,150	2,139	2,279	2,271	2,274	2,287	2,348	2,365	2,388	2,420	2,423

[a]One kilogram = 2.2046 pounds

[b]Total calories is exclusive of liquors and drinks

*Source: (36)

In 1955, wheat constituted 7 percent of the gross agricultural production (26), but in 1965, this percentage dropped to only 3 percent while output of livestock products and vegetables, which had made up 10 percent and 7 percent respectively of the total agricultural production in 1955, increased to 19 percent and 12 percent respectively in 1965 (26). The component ratio of agricultural production is shown in Diagram 1.

Such characteristic marks as eating habits and style of dress are showing change in varying degrees but particularly among young Japanese. Such changes affect the type of foods and agricultural raw materials that will find acceptance by the Japanese.

Such a change in the food demand was promoted by such factors as the increase in the urban population, rising consumer income, the urbanization of the rural areas, westernization, the spread of knowledge of nutrition and the like. Confronted with such notable changes, agricultural production has had to be upgraded, and in the agricultural administration the past emphasis on increasing production of staple good crops and livestock-meat industry has come to be reconsidered.

3. Changes in the structure of the demand for the rural labor force

The biggest change that the high rate of Japan's economic growth caused to agriculture is the decline in farm population. Japan's farm population, which had been in chronic excess,

began to decline gradually around 1952-53 and after 1955, the pace of exodus from farm villages increased recognizably. After 1960 the outflow of the farm population became remarkably noticeable.

The 1955-1960 period showed a decline of 2 million in the farm population and 1960-1965 a drain of 4,400,000 more (26 and Table 14). At first, the migrants consisted mainly of the young age group centering on new school graduates and the surplus population in the years following World War II. But in 1960, the pattern of outflow showed a change, for instance, persons who had until then engaged in agriculture as well as farm householders and the first sons began to leave their farms and find other work from non-agricultural sectors to commute to and from the farming villages. The increased outflow of farmers was due to the rise in demand for labor in non-agricultural sectors. Farm villages were able to supply the needed labor because investments in agriculture had increased and labor productivity had improved, enabling the farmers to produce with less hands.

4. Changes in the number of farm households with side jobs and farm households as classified by scale of management

It was pointed out earlier that the farming population decreased as an increasing number of farmers engaged in non-agricultural work. Some 65 percent of the total farm households were engaged in side jobs in 1955 and 79 percent in 1965 (26). The increase was particularly large in farm households who

Table 14. Decline in population of farming households and population engaged in agriculture*

(Unit: 10,000 persons)

	1955	1960	1965
Population of farming household	3,662	3,455	3,011
Decline compared with preceding year	138	207	443
Population engaged in agriculture	1,541	1,338	1,108
Decline compared with preceding year	--	202	222
	(121)[a]	(177)[a]	

[a]Population engaged in agriculture based on "Labor Force Survey", Office of Prime Minister. However, because the figures for 1950 did not link, a comparison of the population was made in the parentheses based on the National Census.

*Source (20)

place greater emphasis on non-agricultural work (second type side job) than on farming. In Table 15 the increase in farming households partly supported by nonfarm income in the period 1955-1965 may be observed (Diagram 2 shows the increase of farm households with side jobs).

According to the "Farm Household Economic Survey", of the total income of farm households in fiscal year 1957, some 43 percent was non-agricultural income, but in 1965, the percentage rose to 56 percent (26). Such a situation indicates that Japanese farm households now make more than half their total income from jobs other than farming. From the farmer's viewpoint, they were able to boost their income from side jobs, but labor productivity of farmers involved in side jobs was 20-30 per cent lower than those engaged exclusively in farming (26).

The smallness of Japanese farms makes it easier for the farm household member to engage in side jobs. It must be pointed out that although Japan's farming population has shrunk, the number of farm households has not decreased much, with many of them operating farms on a very petty scale.

The proportion of farm households owning farmland of more than 2 hectares rose slightly from the 5 percent during the 1955-1960 period to 6 percent in 1965 (19). On the other hand, the proportion of farm households owning farmland of smaller than 0.5 and 0.5-1.0 hectares decreased slightly during the 1955-1965 period (see Table 16).

Diagram 2. Increase of farm households with side jobs (26)

[a]The farm households who place greater emphasis on farming work than nonagricultural work

[b]The farm households who place greater emphasis on nonagricultural work than on farming

Table 15. Increase in farming households partly supported by non-farm income*

(Unit: 1,000 households)

	Total No.	Specialty	1st-class farming[a] households partly supported by other income	2nd-class farming[b] households partly supported by other income
Feb.1955	5,838	2,026	2,214	1,599
Feb.1960	5,823	1,960	1,984	1,878
Feb.1965	5,466	1,118	2,035	2,313

[a]Same as the first type side jobs farming households.

[b]Same as the second type side jobs farming households.

*Source: (19)

Table 16. Component ratios of farming households classified by scale of land cultivated*

(Unit: %)

	Smaller than 0.5 ha.	0.5-1.0 ha.	1.0-1.5 ha.	1.5-2.0 ha.	Larger than 2.0 ha.
Feb.1955	39.3	33.6	16.9	6.4	3.6
Feb.1960	38.7	32.7	17.2	6.9	4.1
Feb.1965	38.2	32.2	17.3	7.4	4.7

*Source: (17)

5. Change in the market conditions for farm products

Since 1954, the world began to see a surplus in agricultural production and the international prices for agricultural products started to go down. Consequently, the domestic prices of Japan's major agricultural products are on a much higher level than the international prices (29).

In viewing the price rise for agricultural products, it is found that the price rise was conspicuous after 1960. During the 1956-1960 period the price rise averaged 1.4 percent a year, but during the 1950-1965 period, prices rose by an average of 8.3 percent annually (19). The reason for the sharp price hikes after 1960 was that the production could not keep up with the increase in demand, and the small scale of Japanese farms as well as the existence of a large number of farmers engaged in side work, which is proving an obstacle to the improvement of farm productivity.

The home market situation has also greatly changed. For instance, the rice market has slackened since the rice supply situation has eased and the gap between the controlled rice price and its black market price has narrowed down to less than one percent in 1960 as against 30 percent in 1951 (29). A similar situation has also risen for barley, rye, potatoes, etc. Thus the basic note of Japan's home market for starchy food crops is one of abundant supply.

On the other hand, livestock products, fruits and others whose demand is increasing, are generally in short supply. Their marketing conditions are not stable. Consequently, the

importing of these agricultural products will undoubtedly increase to some extent, due to Japan's economic conditions.

V. RECENT DEVELOPMENTS OF THE LIVESTOCK INDUSTRY IN JAPAN

A. Structural Changes in the Livestock Industry of Japan

1. The change in the number of livestock since 1959

With the sharp increase in the demand for livestock and poultry products ince 1959 (see Table 24), the Japanese have made expansion of livestock and poultry a top goal in agricultural development. The output of livestock products had made up 10 percent of the total agricultural production in 1955 and increased to 19 percent in 1965 (26). The plans are being carried out vigorously with special emphasis given to increasing production of dairy products, pork, chicken meat and eggs. The number of livestock and chickens on farms and the trends in numbers are shown in Table 17 which indicates changes in number of livestock and chickens raised in Japan.

The most significant decline in livestock industries is found in the number of horses (see Table 17 and Table 24). Between 1950 and 1966, the number of horses dropped from 1,070,000 head to only 268,000 head in 1966 (36). One reason for the decline is that horses for military uses are no longer needed. Also, with the switch to the popular use of power agricultural machines like tractors and tillers in farming, horses and draft cattle are not needed in such large numbers as in the early days. Therefore, the trend in utilization of Japanese cattle (draft cattle and beef cattle) has also greatly changed from that of work cattle to beef cattle, and the number continued to rise with increasing demand for beef up to recent years.

However, a greater decrease is noted in the number of beef cattle producted for meat which has fallen recently as its rather low price somehow distracted the farmers' interests in raising them; the work utilization of cattle has dropped, and more farmers have turned to raise dairy cattle which are more profitable in the flat land area.

Numbers of sheep and goats on farms are also declining, with sheep showing the largest decline. Numbers of dairy cattle, swine, and chickens are rising greatly due to sharp increases in demand for meat, milk and eggs and to the profitabilities of these industries due to the encouragement of the Japanese government to improve and modernize farm management and agricultural techniques.

As shown in Table 17, livestock is raised in small herds, and the numbers of livestock raised other than poultry by the Japanese farmers is still quite low. However, the future livestock population is expected to continue expanding.

2. The change in the scale of livestock breeding per farm

The expansion of the scale of livestock breeding has been phenomenal in recent years. Before the war most of the livestock was used for tilling the land; and livestock industry was mostly an adjunct to the main enterprise of agriculture, the cultivation of rice. The number of animals remained generally constant. After the war, with the increase in demand for livestock products, the number of dairy cattle, pigs, chickens, etc., increased markedly (see Table 24). On the other hand,

Table 17. The structural change in the livestock breeding since 1955*

		1955	1960	1961	1962	1963	1964	1965	1966
Dairy Cattle	Number of farms that raise dairy cattle (1,000)	254	410	413	416	418	402	382	361
	Number of dairy cattle (1,000)	421	824	885	1,002	1,145	1,238	1,289	1,310
	The average number of dairy cattle per farm	1.7	2.0	2.1	2.4	2.7	3.1	3.4	3.6
Beef Cattle	Number of farms that raise beef cattle (1,000)	2,280	2,031	1,975	1,879	1,803	1,673	1,435	1,163
	Number of beef cattle (1,000)	2,636	2,340	2,326	2,332	2,337	2,208	1,886	1,577
	The average number of beef cattle per farm	1.2	1.2	1.2	1.2	1.3	1.4	1.3	1.4
Horses	Number of farms that raise horses (1,000)	778	463	511	445	376	317	260	222
	Number of horses (1,000)	927	673	621	547	471	296	322	268
	The average number of horses per farm	1.2	1.2	1.2	1.2	1.3	1.2	1.2	1.2
Swine	Number of farms that raise swine (1,000)	528	799	930	1,025	803	711	702	714
	Number of swine (1,000)	825	1,918	2,640	4,033	3,296	3,461	3,976	5,160
	The average number of swine per farm	1.6	2.4	2.8	3.9	4.1	5.0	5.7	7.2
Chickens	Number of farms that raise chickens (1,000)	4,508	3,839	3,831	3,806	3,723	3,496	3,263	2,786
	Number of chickens (1,000)	45,715	54,627	71,891	90,066	98,447	120,706	138,476	136,420
	The average number of chickens per farm	10.1	18.8	18.8	23.7	26.5	34.5	42.4	49.0

*Source: (15; 20; 28)

draft animals, also used for meat, decreased with the spread of agricultural machinery.

The increase in the number of livestock has been mostly brought about by the increase in the number of farms that raise livestock (Table 17). In the past ten years, the average number of livestock per farm generally increased considerably, other than for horses, which kept at a constant level throughout the period. The increase was particularly large in the average number of swine and chickens per farm, which increased to 7.2 head and 49 head in 1966 from 1.6 head and 10.1 head in 1955, respectively (see Table 17).

The structural changes in livestock breeding per farm during the period of 1955 to 1966 are shown in Table 17.

3. The change in production of total livestock

Japan's total production of livestock was valued at 1,187.5 million in 1966, an increase of more than 99 percent over 1960, and an increase of more than 260 percent over 1954 (41). The index number of total livestock production in 1966 as compared to the base period, 1957-1959 average, shows 235 and a peak in those years (41).

On the other hand, per capita production of total livestock in Japan has more than doubled since the 1957-1959 base period. Table 18 shows that the index number of per capita production of total livestock in 1966 as compared to the base years of 1957-1959 was 218 and had reached a peak in that year (Table 18).

Table 18. Japan: Aggregate (in millions) and indices of production, by commodities, average 1957-59 (base period) and annual 1954-66*

Commodity	Average 1957-59	1954	1955
Aggregation of Production			
Total crops	3,770.1	3,008.1	3,804.1
Total livestock	505.6	338.4	391.8
Total agriculture	4,275.7	3,346.5	4,195.9
Total food	4,080.2	3,181.5	3,988.8
Feed deduction	202.2	135.4	156.7
Net agriculture	4,073.5	3,211.4	4,039.2
Net food	3,877.8	3,046.0	3,832.1
Index of Production			
Total crops	100	80	101
Total livestock	100	67	77
Net agriculture	100	79	99
Net food	100	79	99
Index of Per Capita Production			
Total crops	100	83	104
Total livestock	100	70	79
Net agriculture	100	82	102
Net food	100	82	102
Index of Population	100	96.1	97.2
(1958 population: 91,540,000)			

*Source: (41)

Table 18 (Continued)

1956	1957	1958	1959	1960	1961
3,527.4	3,654.0	3,743.7	3,912.8	4,055.1	4,001.1
422.3	460.0	505.4	551.3	594.2	740.9
3,949.7	4,114.0	4,249.1	4,464.1	4,649.3	4,742.0
3,741.9	3,912.8	4,053.1	4,273.9	4,468.9	4,554.3
168.9	184.0	202.2	220.5	237.7	296.4
3,780.3	3,930.0	4,046.9	4,243.6	4,411.6	4,445.6
3,573.0	3,728.8	3,850.9	4,053.4	4,231.2	4,257.9
94	97	99	104	108	106
84	91	100	109	118	147
93	96	99	104	108	109
92	96	99	105	109	110
96	98	99	103	106	103
85	92	100	108	116	143
95	97	99	103	106	106
94	97	99	104	107	107
98.3	99.1	100.0	101.0	101.8	102.7

Table 18 (Continued)

1962	1963	1964	1965	1966
4,102.5	3,982.1	4,048.6	4,019.0	4,068.7
890.5	936.9	1,067.9	1,150.6	1,187.5
4,992.9	4,919.0	5,116.5	5,169.6	5,256.2
4,739.7	4,698.0	4,837.9	4,915.3	4,988.4
356.2	374.8	427.2	460.2	475.0
4,636.7	4,554.2	4,689.3	47,709.4	4,781.2
4,437.5	4,323.2	4,410.7	4,455.1	4,513.4
109	106	107	107	108
176	185	211	228	235
114	112	115	116	117
114	111	114	115	116
105	101	101	100	100
170	177	199	213	218
110	107	109	108	108
110	106	108	107	107
103.7	104.8	105.9	107.0	108.0

It is easily shown from Table 18 that the value and the rate of growth of production of total livestock become one of the more important and also the fastest growing sector in Japanese agriculture. As described before, output of livestock products, which had made up 10 percent of the total agricultural production in 1955, increased to 19 percent in 1966 (see Diagram 1).

4. Consumption of livestock, poultry and sea food products

Japan's consumption of livestock, poultry and sea food products has continued to increase remarkably since 1955 reflecting the sharp rise in production and unusually strong demand owing to Japan's economic prosperity. Per capita consumption of livestock, poultry and sea food products in 1955 was 37,900 kilograms; in 1965 it had increased by 110 percent to 79,700 kilograms (see Table 20). The future consumption of livestock, poultry and sea food products is expected to be expanded in parallel with the increased national income, centralization of population in urban districts and changes in the mode of living and taste.

From the view of components of per capita consumption of livestock, all of them have increased considerally other than sea foods which has remained nearly constant since 1961 (see Table 20).

5. The sharp increases in feedstuffs

Table 20. The changes in per capita consumption in kilograms of livestock, poultry and sea food products, 1955-65*

(Unit: Kilograms)

Beef & veal	Pork	Horse meat	Goat & mutton	Total red meat	Chicken meat	Milk & milk prod.	Fish & shell-fish	Eggs	Total livestock, poultry & sea food products
1955	1.100	0.800	--	2.100	0.300	12.000	20.100	3.400	37.900
1956	1.200	1.000	--	2.400	0.300	14.100	18.900	3.400	39.100
1957	1.560	1.505	0.080	3.563	0.300	16.500	22.900	3.800	47.063
1958	1.438	1.751	0.084	3.475	0.300	17.800	21.800	3.900	47.275
1959	1.563	1.938	0.114	3.501	0.300	19.800	22.700	4.000	50.301
1960	1.200	1.200	0.200	2.900	0.400	25.600	23.400	4.800	56.900
1961	1.200	2.100	0.200	3.700	0.500	25.500	28.600	6.500	64.800
1962	1.200	2.700	0.200	4.400	1.000	30.400	27.200	6.700	69.700
1963	1.600	2.300	0.400	4.600	1.200	35.800	27.800	7.400	76.800
1964	1.800	2.600	0.500	5.200	1.400	37.300	24.800	8.600	77.300
1965	1.500	3.100	0.500	5.300	1.600	36.300	27.700	8.800	79.700

*Sources: (10; Mr. Juichi Yoshida, Research Associate, Department of Agricultural and Forestry Economics, Faculty of Agriculture, Kyoto University, Kyoto, Japan. Japanese agricultural statistics, Private communication. December 13, 1967.)

Japan's demand for feedstuffs is related to the growing livestock and poultry industry. Significantly, the Japanese have made expansion of livestock and poultry a top goal in agricultural development plants. The plans are being implemented vigorously with special emphasis given to increasing production of dairy products, pork, chicken meat and eggs.

Owing to a rapid expansion of the livestock and poultry industry in Japan and a limited expansion of domestic production of feedstuffs, the gap between feed requirements and domestic supplies is widening. Import requirements are booming to such an extent that Japan has become the world's fastest growing feed-grain importing market.

a. Commercial feed

In recent years, the consumption of feedstuffs has been increasing, corresponding to the sharp expansion and development of the Japanese livestock and poultry. The consumption of concentrated feed has increased substantially (see Table 21) reflecting the sharp increase in the number of swine and poultry.

Table 22 shows that in 1965 the total consumption of feed was 15,452 thousand tons in T.D.N. (total digestable nutrients), about 75 percent higher than 1956. The consumption of roughage feed was 6,432, and concentrate feed in 1965 was 9,020 thousand tons in T.D.N., 23.6 percent and 155.9 percent, respectively, higher than in 1956. These estimates were calculated from Table 22. On the other hand, the proportion of concentrate

Table 21. The change in consumption of concentrate feeds *

(Unit: 1,000 metric tons)

Year	Domestic Production	Imports	Total
1956	4,601	578	5,179
1963	5,474	4,753	10,227
1964	6,248	5,396	11,644
1965	6,290	5,959	12,249

*Source: (24)

Table 22. The change in the consumption of feeds *

(Unit: 1,000 metric tons in T.D.N.)

Year	Roughage feeds	Concentrate feeds	Total
1956	5,202	3,525	8,727
1963	5,630	7,460	13,070
1964	5,875	8,170	14,045
1965	6,432	9,020	15,452

*Source: (24)

feed to total feed had increased from 40 percent in 1956 to 58 percent in 1965, reflecting sharp increases in concentrates (24).

With a rapid increase in demand for concentrated feed, the domestic production has not increased proportionately, and the amount of the concentrate feed imported has increased greatly. It can be clearly seen from Table 21 that the total consumption of concentrate feed in 1965 was 12,249 thousand metric tons, an increase of 10 percent (24) over 1964 and 136 percent[a] over 1956. The proportion of imported concentrate feed to total consumption of concentrates had increased remarkably from 11.1 percent[a] in 1956 to 49 percent (24) in 1965. The total consumption of concentrate feed increased 2.5 times domestic production increased 37 percent and imports increased 11 times during the period 1956 to 1965 (24).

Accompaning the sharp increase in imported concentrated feed, there is an increased use of formula feed as shown in Table 23. In 1965 the amount of formula feed consumption was 8,151 thousand tons (Table 23); it is compared with 828 thousand tons, an increase of about ten times from 1956 to 1965.

Formula feed production in 1965 in Japan according to end usage is roughly as follows:

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[a]Calculated from Table 21.

Chickens 65%

Hogs 22%

Dairy Cattle 10%

Others 13%

These estimates were calculated from Table 23. The component ratio of formula feed used by chickens constituted more than one half of total production of formula feed.

b. Feed supplies

Japan produces a very small proportion of its own feed supplies; and most of that which it does produce is the by-product of other processing industries such as flour milling, soybean processing, and brewery and distilling operations. Japan must, therefore, import large amounts of feed grains to support its rapid development of livestock industry. Corn and grain sorghum are the largest volume imports for Japan, and the United States is the largest exporter of these food grains to Japan. In 1965 Japan imported 2.3 million metric tons of corn and 1.3 million metric tons of grain sorghum from the United States (34). Total imports of feed grains by Japan for 1965 amounted to $172 million (34).

Tables 23. The change in the production of formula feeds*

(Unit: 1,000 metric tons)

Year	Total	Utilization			
		Chicken	Swine	Cattle	Misc.
1956	828	-----	-----	---	---
1963	6,201	4,530	875	640	156
1964	7,496	5,430	1,157	711	198
1965	8,151	5,314	1,773	803	261

*Source: (24)

B. Factors Contributing to Changes in Livestock-Raising in Japan

The structure of livestock-raising in Japan has changed remarkably in recent years through increased production of dairy cattle, swine and chickens and decreased production of draft animals used for meat. Such a big change in the structure of livestock industry in Japan since 1956 may be attributed to the following factors:

First, the important factor in the sharp increase in dairy cattle, swine and chickens is due to the great increase in the demand for livestock and poultry products which have resulted from increased incomes of consumers, increase in population, the generally favorable economic situation which has been prevailing in Japan since 1955 (see Table 12 and Table 6),

and changes in the mode of living and taste.

Secondly, the direct factor of the decline in breeding of cattle and horses as draft and meat-producing animals includes the shift to other types of livestock because the need for draft animals has been reduced (see Table 19); by the spread of farm machines, which was discussed in the preceding part.

Thirdly, another important factor affecting structural changes in the livestock industry of Japan is mainly due to promoting the improvement of livestock management and to improvement of the marketing of livestock products by the Japanese government. The status of livestock in the agriculture of Japan was comparatively low in the prewar period, but it has made tremendous progress reflecting the rising national income and living standards in consequence with a speedy economic recovery and development from the war. However, in order to make further progress, various measures are necessary. The Ministry of Agriculture and Forestry in Japan has been undertaking the following important laws for promotion of the livestock industry[a].

(1) Domestic Animal Improvement and Propagation Law (revised in 1961)

(2) Livestock Products Price Stabilization Law (enacted in 1961)

(3) The Temporary Measure Law for Subsidy to Producers of Milk for Manufacturing (enacted in 1965)

(4) The Dairy Farming Promotion Law (enacted in 1954)

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[a]The important laws for promotion of livestock industry in Japan.

(5) The Feed Supply and Demand Stabilization Law (enacted in 1952)

(6) The Domestic Animal Infectious Disease Control Law (enacted in 1951)

Fourthly, livestock production in Japan has been officially recognized for some years as an important sector of the farming economy, constituting 18.6 percent of the total agricultural production in 1965 (26). The Basic Agricultural Law of 1961, which contains the major guidelines for current and future farm policy, called for strong support for livestock development.

The demand for livestock products is expected to expand further because of the change in the national diet pattern. In order to ensure a stabilized supply of good quality livestock products the productivity improvement seems, among other things, as a most important measure. To ensure this, the small scaled, inefficient farm needs to be rationalized and improved by such measures as the establishing of grassland, planting of feed crops, expanding herd size, improvement of animal barns and practices such as group rearing of dairy calves. In addition, promoting such measures as price stabilization, improved breeding of domestic animals and animal health and sanitation are emphasized. The outline of principle legislation related to the livestock industry is as follows:

(1) Domestic Animal Improvement and Propagation Law. (revised in 1961)

The purpose of this Law is to secure the breeding stock, intensify the utilization thereof and promote the improvement and propogation thereof. According to this Law, any male stock of cattle, horse, pig, etc., shall not be used for covering service (including artifically insemination of livestock) unless it is issued a breeding certificate by the Minister of Agriculture and Forestry, and any person other than a livestock artificial inseminator authorized by the Law shall not collect the semen for artificial insemination of livestock, treat it, or inject it into female stock.

(2) Livestock Products Price Stabilization Law (enacted in 1961)

The objective of this Law is to ensure the price stabilization of major livestock products. And the price stabilizing procedure is delegated to the Livestock Development Corporation duly established under the Law by purchasing and selling dairy products. The stabilized ceiling and floor prices are determined by the Minister of Agriculture and Forestry. In such a way, the price of livestock products is to be stabilized.

(3) The Temporary Measure Law for Subsidy to Producers' Milk for Manufacturing (enacted in 1965)

The objective of this Law is to stabilize the

price of fresh milk for manufacturing and milk products. The Government grants a subsidy to milk producers for the difference in the standard market price of fresh milk for manufacturing and guaranteed producer's price, both prices being determined by the Government.

(4) The Dairy Farming Promotion Law (enacted in 1954)

The Law was enacted in 1954 and was partially amended in June, 1965 to meet the striking changes in dairy farming in recent years. The Law codifies as its prime objectives, the planned modernization of dairy farm management in the proper dairy farming districts, fair and equitable transaction of liquid milk, consumption development of milk products to contribute to a stabilized supply of milk products.

The outline of the measures provided by the Law is as follows:

(a) The dairy farming modernization plan is to be established under the definite program linking the State, prefecture and local community. That is the program is to be established for estimating demand and supply prospects of liquid milk by district, targets for liquid milk production, basic indices for modernized dairy farm management and the rationalization of milk collection and milk factories.

(b) A group of modern dairy farms is to be established in the liquid milk producing belt in connection with the dairy farming modernization system.

(c) To ensure a fair and equitable transaction of liquid milk, milk transaction between milk producers and milk manufacturers is to be concluded in writing.

(d) Liquid milk is to be gradually included in the school lunch.

(5) The Feed Supply and Demand Stabilization Law (enacted in 1952)

This Law is aimed at checking any undue rise in feed prices by stabilizing the feed supply and demand in the country. Under this law, the government purchases and sells feed.

(6) The Domestic Animal Infectious Diseases Control Law (enacted in 1951)

The purpose of this Law is to promote the livestock industry by preventing the outbreak and controlling the spread of domestic animal infectious diseases.

C. The Recent Situation of the Livestock Industry in Japan

The Japanese livestock industry has not historically been a large share of the Japanese economy. However, Japanese

people have been eating meat for over 100 years. In recent years, particularly since 1960, the Japanese appetite for meat has skyrocketed; and the average Japanese has the money to buy meat and other items which used to be luxuries.

One of the spectacular developments in Japanese agriculture since the war has been the expansion of the livestock industry, particularly dairying and pig raising. Japan consumed very little milk and meat before the war. The major source of protein was fish. After the war the Japanese government took measures to encourage farmers to raise dairy cows. Meanwhile, the prosperity of the industry has enhanced the purchasing power of urban workers and the demand for protein-rich food. As a result, the number of cows and pigs in Japan has increased by leaps and bounds.

1. Rapid increase in dairy cattle

Prior to World War II, the dairy industry in Japan was of little importance; however, since the war it has grown rapidly. The total number of dairy cows has increased from 239,000 (17) in 1945 to 1,310,000 in 1966 (20). Indigenous breeds have been largely replaced by higher producing Holstein-Freisians from the West. Holsteins occupy 98 percent of the total dairy cows, numbering 1,310,000 followed by Jerseys, numbering about 26,000 (20). Besides these breeds, Ayrshire, Guernsey and Brown Swiss are raised regionally in small numbers, except for the Jersey, which the Japanese government imported

chiefly from Australia and New Zealand, other minor breeds failed to suit various farming conditions in Japan; and they are disappearing gradually.

With the rapid economic growth after the war, following the increase in national income, improvement of food life, and also from the standpoint of national health, the amount of consumption of milk and dairy products was enhanced. In order to correct this situation, the Japanese government enacted the Dairy Promotion Law in 1954: and as the work to contract the intensive dairy farm districts, the milk producing area for milk products has been established, centering around grass-land farming. Artificial insemination has been widely adopted, and large quantities of commercial feeds have been imported annually. In addition, technical assistance on grass growing and grassland management has been requested from FAO. Stimulated by these measures, dairy farming rapidly developed in these few years. From 1955 to 1964 the number of farms keeping dairy cattle increased from 254,000 to 402,000 -- an increase of 58.2 percent -- and the number of cattle on the farms rose from 421,000 to 1,238,000 -- an increase of 194 percent in ten years (Table 24). On the average, the number of dairy cattle kept per farm also increased in the period from 1.7 in 1955 to 3.6 in 1966 (Table 17).

Milk production per cow is high, on the average of about 5,000 kg a year; and it is considered that the milk producing ability generally equals the world level. Total milk pro-

duction in Japan increased more rapidly than the number of cattle because the proportion of cows used for milk has also increased gradually.

Diffusion of artificial insemination in the dairy industry is remarkable. In 1965 this method was applied to 99 percent of the total cows (20).

The growth of dairy farming in Japan is significant in the history of farm development. It disproves an earlier belief that there could be no dairy farming in an intensively cultivated area and signifies a new trend of enterprise combination in the newly developing countries. As urbanization and industries develop and the demand for fluid milk increases, farmers in many areas may find it more profitable to undertake dairying, even with purchased feedstuffs.

2. Decline of draft and beef cattle

There has been a steady decline in beef cattle numbers in Japan during the past ten years. The number of draft and beef cattle increased by 30 percent in seven years (1949-56) from 2,091,985 to 2,718,620 (42). The number of farms keeping draft and beef cattle also increased at about the same pace reflecting the postwar recovery. But the number of draft and beef cattle has been declining since 1957. By 1966, a peak of 2,718,620 head of draft and beef animals had fallen to 1,577,000 head, a decrease of about 42 percent (20; 42) in ten years. The reason for the recent decline in the

number of draft and beef cattle is not difficult to find. Firstly, the rapid progress in farm mechanization has made draft cattle redundant. Secondly, the rapid expansion of dairy cattle has exerted great pressure on farmers' limited feed supplies and compelled them to reduce their non-productive livestock. Thirdly, one factor that has prevented a more rapid depletion of draft and beef cattle numbers is the growing supply of dairy cows for slaughter. The number of dairy cows on farms has climbed almost as rapidly as the decline in draft and beef cattle.

Rising beef prices, growing consumer demand for quality beef, and the drastic drop in cattle numbers are combining to create headaches for Japan's livestock industry and agricultural planners. For several hundred years, the sole purpose of these animals was farm power. The replacement of many of these animals by small tractors on farms has consequently contributed to the decline in cattle numbers and beef production.

3. Expansion of pig raising

The expansion of pig raising in post-war Japan offers another example of the practicability and desirability of the proper combination of animal husbandry with crop culture.

Due to feed shortages during the war, the number of pigs in Japan decreased drastically from 552,011 at the first of February of 1942 to 88,082 in 1946 (17), the lowest ever recorded. After the war, as feed conditions became favorable

and demand for meat increased the number of farms keeping pigs and the total number of pigs increased rapidly up to the present. There was 5,160,000 pigs kept on 714,000 farms in Japan (20). This represents an expansion of more than 13 times in the number of farms raising pigs and over 58.6 times in the number of pigs on farms (20; 42).

In the twelve years from 1955 to 1966, the number of pigs increased from 825,000 to 5,160,000, an increase of 523.6 percent (Table 17); and the number of farms raising pigs increased from 528,000 to 714,000, a 35 percent increase (from Table 17). In 1955 there was, on the average, 1.6 pigs per farm, whereas 12 years later there were 7.2 pigs per farm in 1966 (Table 17).

4. Rapid decrease in horses

Horses were formerly used for draft power on farms in certain parts of Jpan, such as Hokkaido, and for military purposes. In 1906 the Japanese government executed the first horse administration program, and 1,500,000 horses were maintained (20). This situation was greatly assisted by the aid and protection policy for the military horses. However, the number of horses decreased after the war following various changes in management conditions that horses proved to be disadvantageous in farm management and agricultural mechanization. In 1935 there were about one and a half million horses in Japan, roughly one to 46 human beings (13). There was one horse to every seven human beings in the United States at

that time.

The number of horses in Japan reached its postwar peak in 1952; at the beginning of that year there were 1,111,973 horses on 930,719 farms, an average of 1.18 horses per farm (12). Since 1952 both the number of farms raising horses and the number of horses decreased rapidly. In 1966 there were only 268,000 horses on 222,000 farms (Table 17). This represents a decrease of about 245.2 percent of the number of horses and 250 percent of the number of farms raising horses in 12 years[a], signifying the impact of farm mechanization, especially in such regions as Hokkaido, and disappearance of the military uses of the horse. This development has undoubtedly contributed to the expansion of dairy industries on certain farms.

At present, the Arab and thoroughbreds are raised for light horses. The Anglo-Norman and Breton are raised for medium sized horses and the Percheron is raised for heavy draft uses. Japan's government endeavors to produce breeds of farm horses of small type by mating Anglo-Norman, that is a half-breed with Breton.

5. Decline gradually in sheep and goats

In mountainous regions in Japan, farmers keep sheep and goats to utilize the wild grass and crop by-products for the production of wool and meat. Production is concentrated mainly

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[a]The figures are calculated from (12) and Table 17.

on the northern-most island of Hokkaido. Very little milk is obtained, however.

Sheep production grew rapidly during the early postwar years, but numbers have declined each year since the peak reached in 1957. There were 327,490 sheep (17) on 221,895 farms in 1949 -- about 1.5 sheep per farm (12). Seventeen years later, in 1966, the number of farms keeping sheep had decreased by 50 percent to 111,000; and the number of sheep had decreased by 55 percent to 146,000 (20). The wool produced satisfies only a small fraction of domestic requirements, and mutton constitutes only a small part of Japan's meat output. Therefore, the domestic production of wool in Japan is not enough to meet the needs of manufacturers, and a large amount of wool is imported annually.

The number of goats also grew rapidly until 1957. Their ability to thrive on rough forage is an advantage, particularly in the hilly area; but farmers are now shifting toward more intensive livestock enterprises. Very little goat milk is marketed, as most of it is consumed by individual farm families.

The number of goats in 1949 was 457,972 equivalent to 1.2 goats per farm keeping goats. It decreased by 39 percent to 281,000 goats raised on 256,000 farms (20). There were on the average 1.2 goats per farm in 1949 and was reduced to 1.1 goats per farm in 1966 (20).

6. Raising poultry

Due to the great increase in demand for eggs and meat, Japan's poultry industry has developed considerably in recent years. It has been supported by the "ten-year program of egg production" developed by Japan's government in 1927 (20). However, it was slowed down temporarily because of the war; but its recovery was rapid due to the rapid economic growth and profitability of poultry raising.

Since the war more farms have taken up poultry raising. In 1949 about two-thirds of the farms kept, on the average, 4.1 chickens. Although the number of farms keeping poultry had not changed much, the number of chickens per farm had more than doubled by 1955 (42). In 1955 there were 45,715,000 chickens on 4,508,000 farms (15). Thereafter, the number of chickens increased by 198 percent to 136,420,000 in 1966; and the number of farms raising chickens decreased by 38 percent to 2,786,000 (15; 20; 28). Thus, the number of chickens per farm increased further to 48.9 (see Table 17).

Until recent years, the poultry industry in Japan was largely confined to the production of eggs. This is still the largest segment of the poultry industry, but since 1960 the broiler industry has developed substantially. In 1966 there were 21,920,000 broilers on 19,000 farms (20). Annual broiler production is estimated at approximately 30 million (34) birds and appears to be increasing rapidly.

The recent developments of the livestock industry in Japan from 1945-1966 is shown on Table 24.

Table 24. Development of the livestock industry in Jpan since 1945*

(Unit: 1,000 head)

Period	Dairy Cattle	Draft Cattle	All Cattle	Horse	Swine	Sheep	Goats	Chicken	Total
1945[a]	239	2,079	2,319	1,121	206	180	250	--	4,076
1946[b]	163	1,827	1,990	1,049	88	196	222	15,369	18,914
1947[c]	159	1,830	1,989	1,054	100	239	278	--	3,600
1948[d]	171	1,932	2,103	1,091	205	291	348	17,401	21,439
1949[e]	202	2,091	2,293	1,072	488	327	458	16,355	20,993
1950[f]	198	2,524	2,722	1,070	510	364	418	16,545	21,629
1951	226	2,234	2,460	1,062	452	449	466	21,845	26,734

[a]Census data as of February 1, 1945

[b]Census data as of February 1, 1946

[c]Census data as of February 1, 1947

[d]Census data as of February 1, 1948

[e]Census data as of February 1, 1949

[f]Census data as of February 1, 1950

*Source: (17; 20; 25)

Table 24 (Continued)

Period	Dairy Cattle	Draft Cattle	All Cattle	Horse	Swine	Sheep	Goats	Chicken	Total
1952	276	2,395	2,671	1,112	799	578	501	30,273	35,934
1953	323	2,503	2,826	1,090	994	693	492	36,586	42,677
1954	356	2,540	2,896	1,020	833	733	531	41,805	47,818
1955	421	2,636	3,057	923	1,170	893	631	45,715	52,389
1956	497	2,719	3,216	888	1,170	893	631	42,640	49,438
1957	587	2,590	3,177	818	1,546	945	669	45,341	52,436
1958	661	2,460	3,121	762	1,649	916	622	50,291	57,361
1959	751	2,365	3,116	728	2,244	864	589	48,215	55,756
1960	824	2,340	3,164	673	1,918	788	561	54,627	61,731
1961	885	2,313	3,198	618	2,604	677	520	71,806	79,423
1962	1,002	2,332	3,334	547	4,033	504	499	90,006	98,923
1963	1,145	2,337	3,482	471	3,296	389	464	98,447	106,549
1964	1,238	2,208	3,446	396	3,461	274	401	120,706	128,684
1965	1,289	1,886	3,175	322	3,976	207	325	138,476	146,481
1966	1,310	1,577	2,887	268	5,160	146	281	136,420	145,162

VI. LIVESTOCK PRODUCTS IN JAPAN

A. Outline of Demand for Meat, Milk and Eggs

In prewar days, animal food items had been limited mainly to fish and shell fish. Vegetable foods comprised the overwhelming majority of food items. The outlay for fish and shell fish was larger than that for meat, milk and eggs. In the postwar days, the westernization and urbanization of Japanese life has progressed rapidly with dietary changes as one of its aspects, and the outlay for meat, milk and eggs increased, overtaking the expenditure for fish and shell fish. Yet the level of consumption is still very low. Per capita consumption of red meat, milk and milk products, and eggs in 1965 is 5.300 kilograms, 36.300 kilograms and 8.8 kilograms, respectively (see Table 20).

According to "The Annual Report on the Family Income and Expenditure Survey" of the Prime Minister's Office, Tokyo, Japan it shows that the average expenditure for meat milk and eggs in 1934-1936 amounted to 1.9% of the total consumption expenditure. While that for fish and shell fish totaled 3.0%, indicating seafood as the predominant item in animal foods. The total expenditure of food and drink in the period was 35.8%.

By contrast, the predominant position of sea food in animal food consumption expenditure has been taken over in the postwar period by meat, milk and eggs. This is indicated in

the same survey which shows that for each household the average expenditure for food and drink in 1963, 1964, 1965 and 1966 amounted to 41.73%, 42.14%, 41.27% and 40.57% respectively. For the same period, meat, milk and egg expenditure were 6.21% in 1963 6.51% in 1964, 6.56% in 1965 and 6.68% in 1966, while fish and shell fish expenditures were 2.74% in 1963, 2.81% in 1964, 2.82% in 1965 and 2.82% in 1966.

The preceding figures show the changing pattern in the food habits between the prewar and postwar period; the postwar consumption of meat, milk and eggs is higher both in the percentage of total food and the growth rate than prewar.

B. Meats

1. The expanding consumption expenditure of meat

The ultimate objective of the meat economy is to supply consumers with meat products in the form, at the time and in the place desired. In addition, these products must be supplied at a price that the consumers are willing to pay. In 1951, expenses on food and drink made up about 48.5% of the total personal consumption expenditure in Japan (29) and in 1965 it had decreased to 31.6% (21; 25) obviously food and drink competed with many other items for the consumer's dollar. Likewise, meat made up 5.9%[a] of the consumer's food and drink

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[a]Mr. Juichi Yoshida, Research Associate, Department of Agricultural and Forestry Economies, Faculty of Agriculture Kyoto University, Kyoto, Japan. Japanese agricultural statisties. Private communication, December 13, 1967.

expenditures in 1957 and in 1965 it made up 8.7%[a]. It faced stiff competition from other foods for the consumer's income.

During recent years there has developed throughout the Japanese business community an increased appreciation of the necessity of gearing the production and marketing system to consumer demand. Consumer demands and preferences for meat and meat products are ever changing. Some of the changes arise from external forces, such as changes in population, population mix, rising consumer income, urbanization and westernization. Other changes are induced by the agencies serving consumers within the meat industry through advertising and promotion, by changes in products, or by other means.

2. Upward trend in meat consumption

Total red meat consumption in Japan has more than doubled since the 1951-1955 period average. Furthermore, the consumption of the different types of meat over the same time period has varied considerably. From 1960 to 1965, for example, beef and veal consumption increased 25%[a], goat and mutton increased 150%[a], pork increased 158.3%[a], and horse consumption stayed about the same. On the other hand, per capita consumption of red meat in 1960 was 2.900 kilograms. In 1965 it had risen to 5.300 kilograms (see Table 25) and with the present interest in livestock production, the total per

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[a]Calculated from Table 25.

Table 25. The change in per capita consumption in kilograms, 1951-1965*

	Beef & veal	Pork	Horse meat	Goat & mutton	Total red meat
Average 1951-1955	--	--	--	--	2.270
1957[a]	1.560	1.505	0.209	0.080	3.563
1958[b]	1.438	1.751	0.202	0.084	3.475
1959[c]	1.563	1.938	0.257	0.114	3.501
1960[d]	1.200	1.200	0.300	0.200	2.900
1961[e]	1.200	2.100	0.200	0.200	3.700
1962[f]	1.200	2.700	0.300	0.200	4.400
1963[g]	1.600	2.300	0.300	0.400	4.600
1964[h]	1.800	2.600	0.300	0.500	5.200
1965[i]	1.500	3.100	0.200	0.500	5.300

[a]91,080,000 on October 1, 1957

[b]92,010,000 on October 1, 1958

[c]92,970,000 on October 1, 1959

[d]93,420,000 on October 1, 1960

[e]94,280,000 on October 1, 1961

[f]95,180,000 on October 1, 1962

[g]96,160,000 on October 1, 1963

[h]97,190,000 on October 1, 1964

[i]98,290,000 on October 1, 1965

*Source: (38)

capita consumption will probably surpass 6 kilograms in 1967. Per capita consumption of fish remained constant, while that of grains and vegetables has decreased slightly. The recent structural changes in per capita consumption are shown in Table 25.

Between the 1951-1955 base period and 1965, and total population of Japan increased from 86.93 million to 98.29 million, an increase of approximately 13%. During the same period, the total consumption of red meat rose from 197,221 metric tons to 533,000 metric tons (see Table 35), an increase of approximately 172%.

3. Production of processed meat

As the general economic condition in Japan continues favorable and dietary habits are improving, demand increases for fresh and processed meat. The production of processed meat reached 135,500 metric tons in 1965 (Table 26), i.e. 40.5 times as much as in the prewar years (1934-1936), reaching only 3,341 metric tons (Table 26). The upward trend of production of processed meat is expected to contine in the future. The production of processed meat continues to increase sharply as shown in Table 26.

4. Poultry meat

Domestic production, imports and consumption of poultry meat continues to increase. Table 27 shows that domestic

Table 26. Production of processed meat*
(Unit: metric tons)

	Loin & boneless	Ham Pressed	Total	Bacon	Sausage	Grand total
1934-1936	--	--	1,702	251	1,387	3,341
1951	2,722	2,743	5,465	270	2,087	7,822
1952	2,874	5,859	8,733	640	3,425	12,800
1953	1,478	8,868	10,346	660	4,005	15,011
1954	1,649	18,014	14,663	805	5,649	21,117
1955	2,188	16,607	18,795	1,044	7,237	27,076
1956	3,177	20,037[a]	23,214[b]	1,414	10,132	34,760
1957	3,701[a]	23,605[a]	27,316[a]	1,624[a]	12,390	41,320[a]
1958	4,653	27,053	31,706	2,036	18,699	52,440[a]
1959	--	--	34,828	2,233	26,210	63,173
1960	4,866	29,310	34,176	2,223	37,801	74,200

[a]Statistics for 1962 and prior include pressed ham and sausage which have 50% or more of fish meat but statistics for 1963 exclude them.

[b]Revised

*Source: (1; 7)

Table 26 (Continued)

	Loin & boneless	Ham Pressed	Total	Bacon	Sausage	Grand total
1961	6,575	40,347	46,922	2,616	49,772	99,308
1962	8,474	49,068	57,542	2,810	63,832	124,186
1963	6,347	49,253	54,690	2,350	56,644	113,684
1964	6,849	54,599	61,448	2,706	60,317	124,471
1965[c]	7,500	60,000	67,500	3,000	65,000	135,500

[c]Preliminary

Table 27. The trend of poultry meat supply and consumption in Japan*

(Unit: 1,000 metric tons)

	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
Domestic production	33	35	38	41	41	44	57	121	142	181	205
Imports	--	--	--	--	--	--	--	--	5	4	8
Total supply	33	35	38	41	41	44	57	121	147	185	213
Total net food consumption	26	27	30	82	32	34	44	91	115	139	160
Per capita consumption	0.3	0.3	0.3	0.3	0.3	0.4	0.5	1.0	1.2	1.4	1.6

*Source: Mr. Juichi Yoshida, Research Associate, Department of Agricultural and Forestry Economics, Kyoto University, Kyoto, Japan. Japanese agricultural statistics. Private communication. December 13, 1967.

production of poultry meat reached 205 thousand metric tons in 1965, i.e., 6.2 times as much as in 1955; imports increased from 5 thousand metric tons in 1963 to 8 thousand metric tons in 1965, an increase of about 60%; per capita consumption reached 1.6 kilograms in 1965, about 5.3 times as much as in 1955.

The supply of commercial broilers shows that a rapid increase has occurred in the Japanese broiler industry in recent years. The supply of commercial broilers was 89,000 metric tons in 1965, 5 times as much as in 1960 (20).

The fluctuations of poultry price have decreased and stabilized due to contract production replacing speculative production.

Poultry marketing on broilers is changing to the carcass basis, and accounted for about 60% of total marketings in 1964 (20).

5. Factors affecting change in per capita consumption of red meat

A wide variety of factors affect the kinds of meat consumed and the per capita consumption of each kind of meat. Among these are production, income, prices of meat and meat products, meat prices relative to prices of other foods, differences in tastes, degree of urbanization and westernization, population and size and age distribution of the family. Some of these factors exert considerably more influence on meat consumption than others. Income and prices probably are most important.

Attempts to expand the market for meat by a firm in the meat economy either as a group or individually must take these factors into account.

a. Production

The expansion of meat production in Japan has been phenomenal in recent years. The amount of total domestic meat production increased from 282,825 metric tons in 1957 to 593,000 metric tons in 1965 or about 110 percent [a]. Total meat production changed substantially following the economic growth and the sharp increase in the demand for livestock products. There is no question that most of the increase in total red meat production can be attributed to the great increase in the production of pork and beef (see Table 28).

On the other hand, horse meat, goat and mutton production decreased considerably. This is because need for draft animals has been reduced by the adaption of farm machines.

b. Urbanization and westernization

The high rate of economic growth in Japan since 1955 has absorbed more of the population from agricultural sectors into the industrial sectors and has affected consumer habits. According to the population census of 1965, 68.1 percent of Japan's population

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[a] Calculated from Table 28.

Table 28. Japanese meat production by types*

(Unit: metric tons)

	Beef	Pork	Horse meat	Goats & mutton	Total
1957	119,415	137,051	19,011	7,348	272,825
1958	127,611	161,140	18,551	7,703	315,005
1959	142,800	179,200	23,900	7,400	353,300
1960	141,000	150,000	23,000	4,000	318,000
1961	141,000	241,000	24,000	3,000	408,000
1962	153,000	322,000	25,000	3,000	503,000
1963	199,000	273,000	21,000	2,000	495,000
1964	228,000	314,000	17,000	2,000	561,000
1965	190,000	386,000	15,000	2,000	593,000

Note: (1) 1957-1959 are based on calendar year. 1960-1965 are based on Japan's Fiscal year (April-March).

(2) Each type of meat production does not include imports.

*Source: (1; 10; Mr. Juichi Yoshida, Research Associate, Department of Agricultural and Forestry Economics, Kyoto University, Kyoto, Japan. Japanese agricultural statistics. Private communication. December 13, 1967).

live in urban areas and 31.9 percent in rural areas (40). The concentration in the cities in high, especially in Tokyo-Yokohama, Osaka-Kobe, Nagoya, and North Kyushu areas, where almost 40 percent of Japan's population are concentrated. With the rapid shift from agricultural to industrial work, Japan is fast becoming a nation of urban people. While this has been happening, the influence of the Western World - particularly of the United States has become increasingly noticeable in the cities and urban areas.

Such traits as eating habits and styles of dress are showing change in varying degrees but particularly among the young Japanese. Such changes affect the type of foods and agricultural raw materials that will find acceptance by the Japanese. The growing demand for bakery products, especially bread, and the increasing use of hides to make Western-style shoes are examples. Improved transportation, refrigeration and food merchandising facilities and techniques are coming into use to better serve the need of the urban population. Advertising and sales promotion are also being used. Consumption patterns differ considerably between urban and rural areas. Expanded and improved food distribution methods are needed, particularly for meats, fresh milk, and other products requiring rapid handling and refrigeration over wide areas. The U.S. style chain-

stores and supermarkets are being considered for use where conditions are favorable.

Food balances for recent years show the changes that are taking place (see Table 29). The Japanese are eating more fruits, vegetables, milk, meat, eggs and fats. These health foods were previously priced beyond the reach of the average consumer. As this shift takes place, demand for some other foods is declining. Such a change in food demand was promoted by such factors as the increase in urban population, the urbanization of rural areas, westernization of Japanese life which has progressed rapidly with dietary changes as one of its aspects, and the spread of knowledge of nutrition.

c. Population growth

Japanese population passed the 98 million mark in 1965 and it ranked as the seventh largest nation in the world. The increase since 1950 totals close to 15 million - about equal to the total number of people living in both Australia and New Zealand (35). The rate of growth has been slowed down to less than one percent annually, a low rate compared with the Far East and many other parts of the world, but not insignificant in relation to Japan's agricultural resource base. The addition of nearly one million more con-

Table 29. The per capita consumption of the principal food products in Japan*

Period	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
Rice	105.3	107.1	115.8	112.8	113.0	114.3	116.5	117.2	116.3	114.7	110.5
Wheat	25.1	23.9	24.8	24.1	25.8	25.8	25.8	26.0	26.9	28.1	29.0
Barley	9.2	9.2	9.2	8.6	6.8	3.9	2.8	2.5	2.3	2.7	2.0
Potatoes	48.7	44.5	43.1	41.9	37.4	34.0	33.0	28.9	25.8	25.9	23.7
Meat[a]	3.3	3.6	4.2	4.6	4.8	4.8	6.1	7.8	7.8	8.4	9.0
Eggs	3.4	3.4	3.8	3.9	4.0	4.8	6.5	6.7	7.4	8.6	8.8
Milk and milk products	12.0	14.1	16.5	17.8	19.8	25.6	25.5	30.4	35.8	37.3	36.3
Sugar	12.3	12.7	12.7	13.8	14.2	14.9	15.7	16.7	16.5	17.3	18.4
Vegetables	67.9	70.0	89.4	72.5	74.6	86.3	84.5	95.9	103.1	100.4	106.1
Fruits	114.6	19.3	20.2	21.1	22.6	25.3	27.3	26.1	29.3	32.5	32.7
Fish and shellfish	20.1	18.9	22.9	21.8	22.7	23.4	28.6	27.2	27.8	24.8	27.7
Fats and oil	2.7	3.0	3.2	3.4	3.8	4.3	4.7	5.3	6.2	6.7	6.9
Total calories[b]	2150	2139	2279	2271	2274	2297	2348	2365	2388	2420	2423

[a]Meat is inclusive of rabbit and whole meats other than red meats
[b]Total calroies per day is exclusive of liquors and drinks

*Source: (Mr. Juichi Yoshida, Research Associate, Department of Agricultural and Forestry Economics, Kyoto University, Kyoto, Japan. Japanese Agricultural statistics. Private communication. December 13, 1967.)

sumers in an already crowded, small country creates problems in feeding, clothing, and housing. The Japanese government estimates that the population will reach 102 million by 1970 (35).

Increases in the total Japanese population have created an expanding market for meat. That a larger population will require more food and fiber even at current consumption levels is obvious enough.

Following World War II there have been changes in the make-up of the population that have affected meat consumption. The number of births each year from 1950 to 1965 have been about one percent of the total population (see Table 30). Advances in the medical field have led to increasing numbers of babies surviving and increasing numbers of older people.

The two groups, people over 60 and children under 10, consume small quantities of meat compared with other ages. The households with teenagers will spend the greatest amount for meat. The pyramid of Japanese population is shown in Diagram 3. The relation between population and production of total livestock is shown in Table 31. This indicates that the increasing rate of per capita production of total livestock is much faster than that of population. It also shows that Japanese meat production has trended upward and at a faster rate than the growth in Japan population.

Table 30. The changes in Japan's population*

(Unit: 1,000 persons)

	Population	Number of births	Number of deaths
1950	83,200	2,239	873
1951	84,540	2,071	787
1952	85,810	1,932	773
1953	86,980	1,795	728
1954	88,240	1,769	708
1955	89,280	1,698	707
1956	90,170	1,604	764
1957	90,920	1,630	701
1958	91,760	1,666	693
1959	92,640	1,620	712
1960	93,420	1,595	697
1961	94,280	1,617	716
1962	95,180	1,669	676
1963	96,160	1,697	668
1964	97,190	1,806	710

*Source: (28)

(Unit: million)

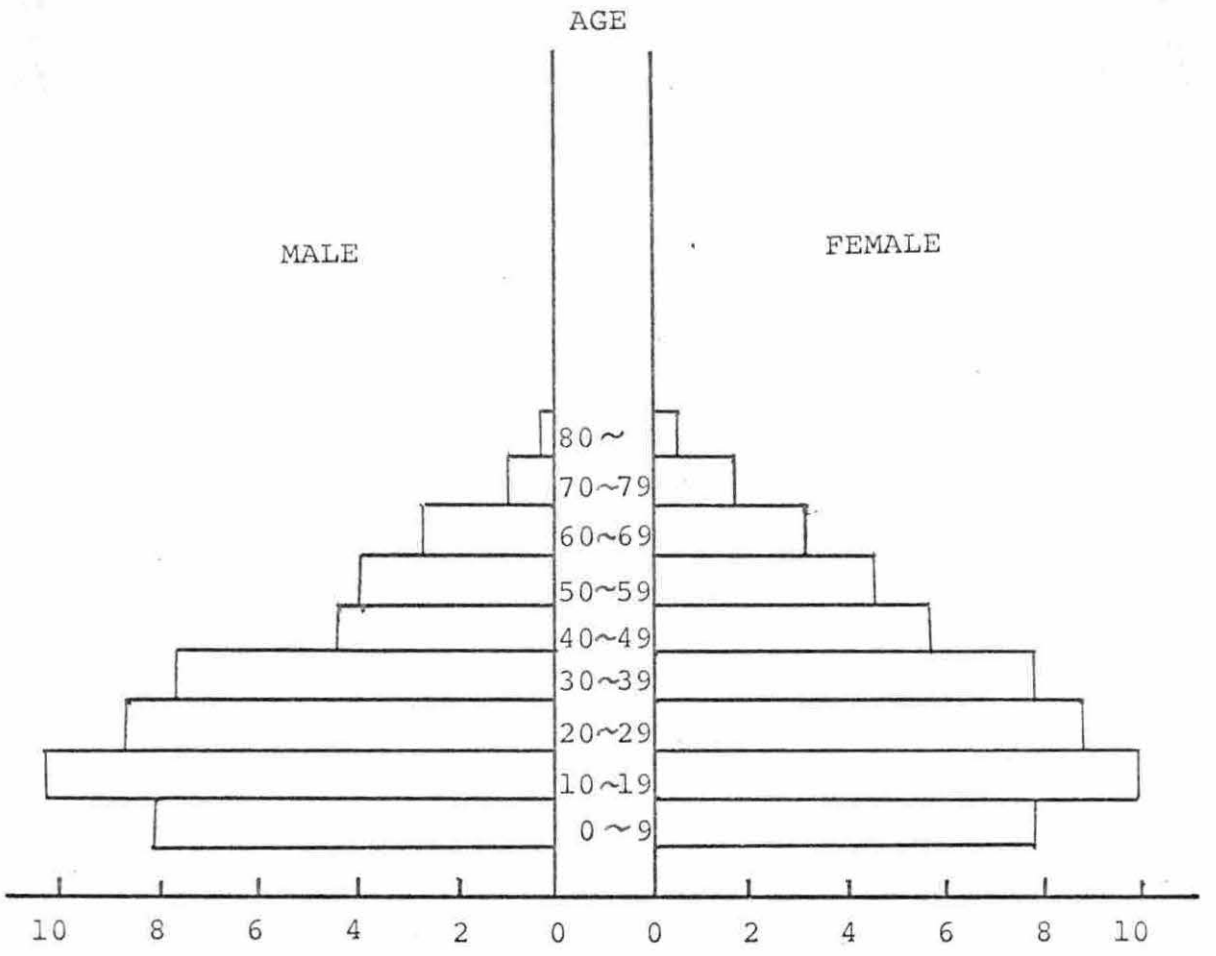

Diagram 3. The pyramid of Japan's population in 1964 (28)

Table 31. Index of per capita production of total livestock and population*

	Per capita production of total livestock	Population
Average 1957-59	100	100.0
1954	70	96.1
1955	79	97.2
1956	85	98.3
1957	92	99.1
1958	100	100.0
1959	108	101.0
1960	116	101.8
1961	143	102.7
1962	170	103.7
1963	177	104.8
1964	199	105.9
1965	213	107.0
1966	218	108.0

*Source: (41)

d. Rising consumer income

The meat consumption studies made by the Bureau of Statisfics, Office of the Prime Minister, Tokyo, Japan indicates that consumers with higher incomes consume larger quantities of meat than do lower income consumers (Table 32). This can be shown by Table 32 that the percentage of meat expenses was only 5.9 percent of the total expenses on foods and drinks, 3,056 thousand million yen, in 1957. Eight years later, in 1965, the percentage of meat expenses had increased to 8.7 percent of total expenses on foods and drinks, 6,732 thousand million yen. Another similar study made by the United States Department of Agriculture indicates that the average monthly expenditure per family in Japan on purchases of meat were only $2.45 dollars in 1960. However, five years later, this had increased to about $5.50, an increase of about 125 percent. These facts seem to indicate that the relation between income and quantity consumed or expenditures for meat consumption is referred to as income elasticity.

The income elasticity for all meats based on a time series analysis of data from 1953 to 1960 was approximately a 1.3% increase in the quantity of meats consumed.

On theother hand, the income elasticity based on a cross-section analysis of data in 1960, 1961, 1962,

Table 32. The percentage of meats in total expenses on foods and drinks*

(Unit: thousand million yen)

	Disposable personal income	Expenditures on food and drink	Expenditures on meat as a percentage of expenditure on food and drink
1957	7,058	3,056	5.9
1958	7,450	3,179	6.3
1959	8,425	3,324	6.4
1960	9,723	3,583	7.0
1961	11,434	4,017	7.5
1962	12,910	4,459	8.4
1963	14,914	5,087	8.5
1964	17,052	5,644	8.6
1965	21,288	6,732	8.7

*Sources: (19; 29; Mr. Juichi Yoshida, Research Associate, Department of Agricultural and Forestry Economics, Kyoto University, Kyoto Japan. Japanese agricultural statistics. Private communication. October 3, 1967.)

1963, 1964 and 1965 was 0.905, 0.976, 0.899, 1.295, 1.337 and 1.186, respectively[a]. During the last three years of this series, the income elasticity was greater than one shows that increases in income were accompanied by relatively large increases in amounts of all meats bought.

e. Price

Another important factor affecting meat consumption is the price of the product. Generally speaking, as prices go up, consumption decreases and vice versa. The ratio of relative change in quantity to a relative change in price is called price elasticity.

The price elasticity for all meats in recent years have not been estimated. However, the price elasticities for pork and beef are 1.17 and 0.34[a] respectively. This indicated that the price elasticity of pork is elastic, while the price elasticity of beef is inelastic. A fall in the price of pork would cause a relatively larger increase in the amount of pork bought (a larger money expenditure on pork will be made by consumers) while less money would be spent by consumers on beef.

Table 34 shows the relation between the increase

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[a]Mr. Juichi Yoshida, Research Associate, Department of Agricultural and Forestry Economics, Kyoto University, Kyoto, Japan. Japanese agricultural statistics. Private communication. December 13, 1967.

in production and rise of prices of livestock products from the average for 1959-1960 to the average for 1964-1965.

f. Supply and distribution of red meat

Clearly, with growing per capita national income, urbanization and westernization, Japan is moving toward a diet pattern that is shifting food demand. Starchy food crops are declining, while livestock and poultry products are increasing rapidly.

Total domestic production for meat in 1965 was 593 thousand metric tons, about 2.2 times as much as in 1957. Total imports reached 91 thousand metric tons in 1965, that is, about 3.6 times as much as in 1957. Total supply and total net food consumption for meat are 684 and 533 thousand metric tons in 1965, approximately 2.2 and 2.3 times over in 1957, respectively.

The structural changes in the supply and consumption of meats will be shown and portrayed in Table 35 and Figures 10, 11, 12, 13, 14 and 15.

C. Milk and Milk Products

1. Changes in milk production and utilization

The demand for milk and milk products has been very high, and it has stimulated milk production. Milk production in the calendar year 1965 totaled 3.2 million metric tons, an increase of seven time over 1961 (see Table 37).

Table 34. Increase in production and rise of prices of livestock products*.

	Average for 1959-1960 increase (rise)	Average for 1964-1965 annual rate (%)
	Production	Prices
Beef cattle	4.9	5.6
Hogs	15.2	4.3
Chicken eggs	15.9	0.5

*Source: (19)

Table 35. The supply and consumption of meat in Japan

(Unit: 1,000 metric tons)

	1957	1958	1959	1960	1961	1962	1963	1964	1965
Pork									
Domestic production	142	170	177	150	241	322	273	314	386
Imports	0	0	1	6	1	0	8	2	0
Total Supply	142	170	178	156	242	322	281	316	386
Total net food consumption	114	136	142	109	134	258	225	253	309
Beef and veal									
Domestic production	117	132	150	141	141	153	199	228	190
Imports	23	3	3	6	6	4	5	6	11
Total supply	140	135	153	147	147	157	204	234	201
Total net food consumption	105	101	115	110	110	118	153	175	151
Horse meat									
Domestic production	17	19	25	23	24	25	21	17	15
Imports	2	2	4	9	5	7	15	26	13
Total supply	19	21	29	32	29	32	36	43	28
Total net food consumption	14	16	22	24	22	24	27	32	21
Goat and mutton									
Domestic production	1	1	2	3	2	3	2	2	2
Imports	0	0	5	18	24	25	54	58	67
Total supply	1	1	7	21	26	28	56	60	69
Total net food consumption	1	1	5	16	19	21	42	45	52

Table 35 (Continued)

	1957	1958	1959	1960	1961	1962	1963	1964	1965
Total domestic production of meats	277	322	354	317	408	503	495	561	593
Total imports of meats	25	5	13	39	36	36	82	92	91
Total supply of meats	302	327	367	356	444	539	577	653	684
Total net food consumption of meats	234	254	284	259	345	421	447	505	533

*Source: (Mr. Juichi Yoshida, Research Associate, Department of Agricultural and Forestry Economics, Kyoto University, Kyoto, Japan. Japanese agricultural statistics. Private communication. December 13, 1967.)

(Unit: 10,000 metric tons)

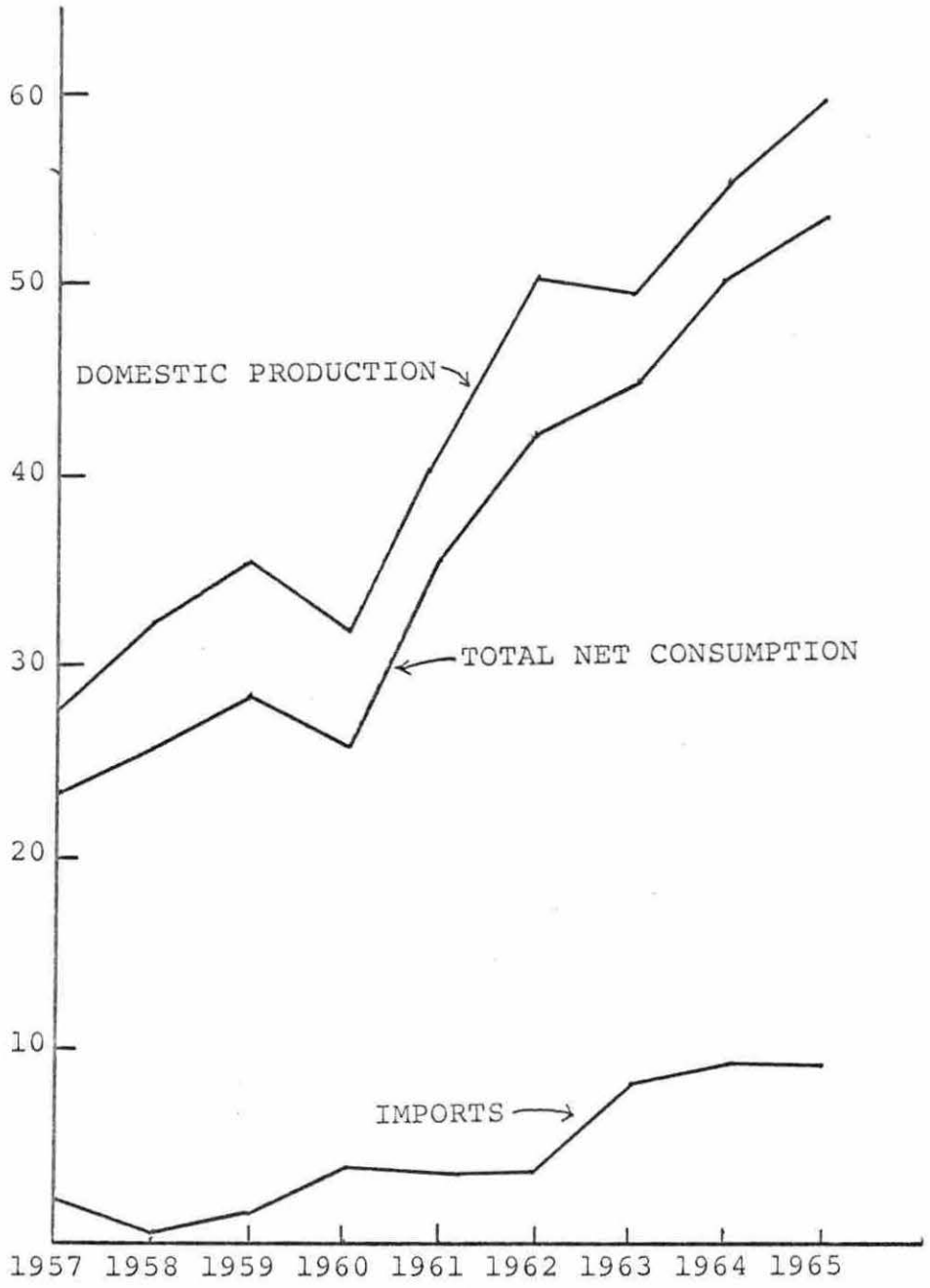

Figure 10. Meat (The diagram is drawn based on the date of Table 34)

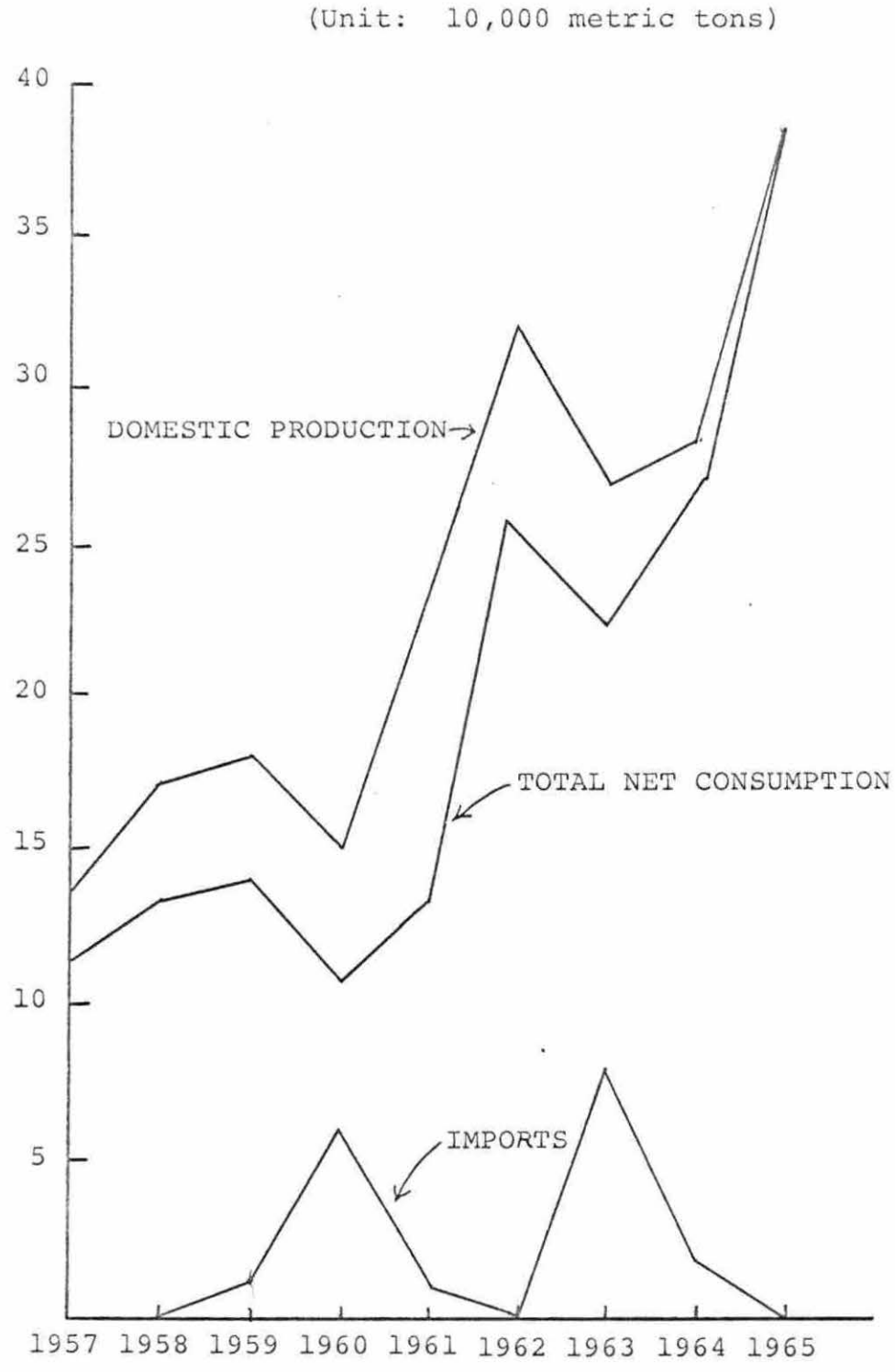

Figure 11. Pork (The diagram is drawn based on the data of Table 34.)

(Unit: 10,000 metric tons)

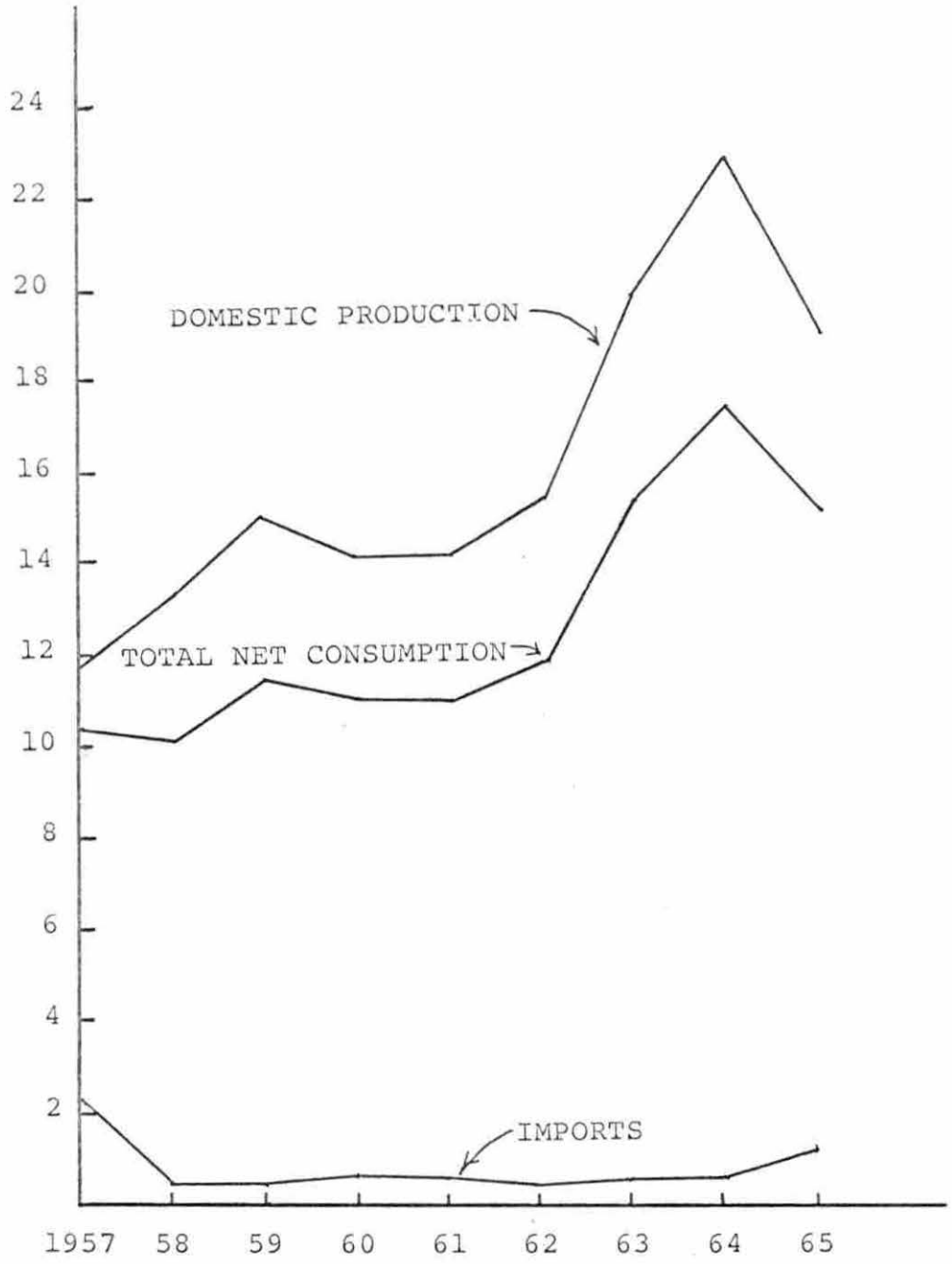

Figure 12. Beef and veal (The diagram is drawn based on the date of Table 34)

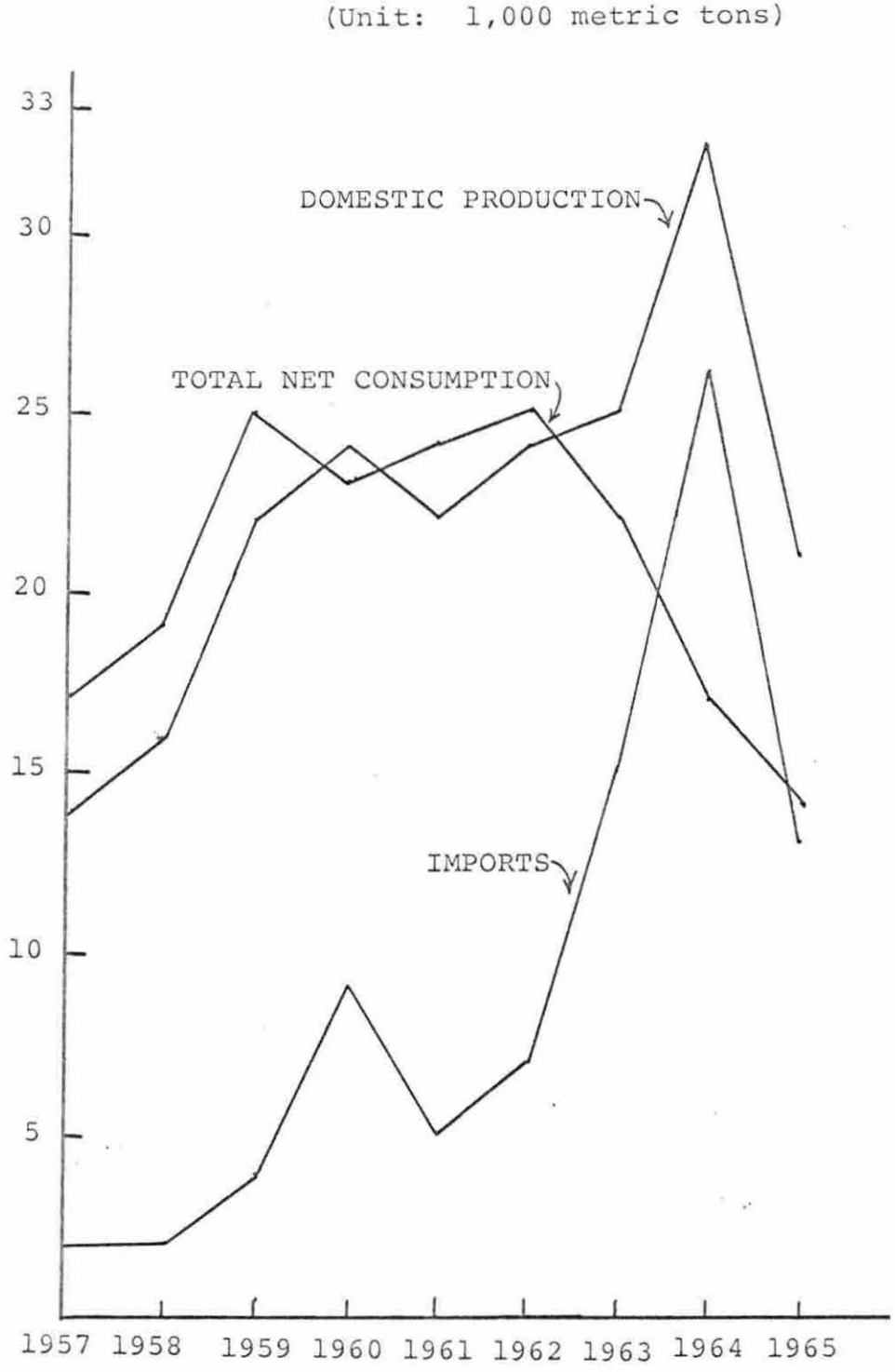

Figure 13. Horse meat (The diagram is drawn based on the data of Table 34)

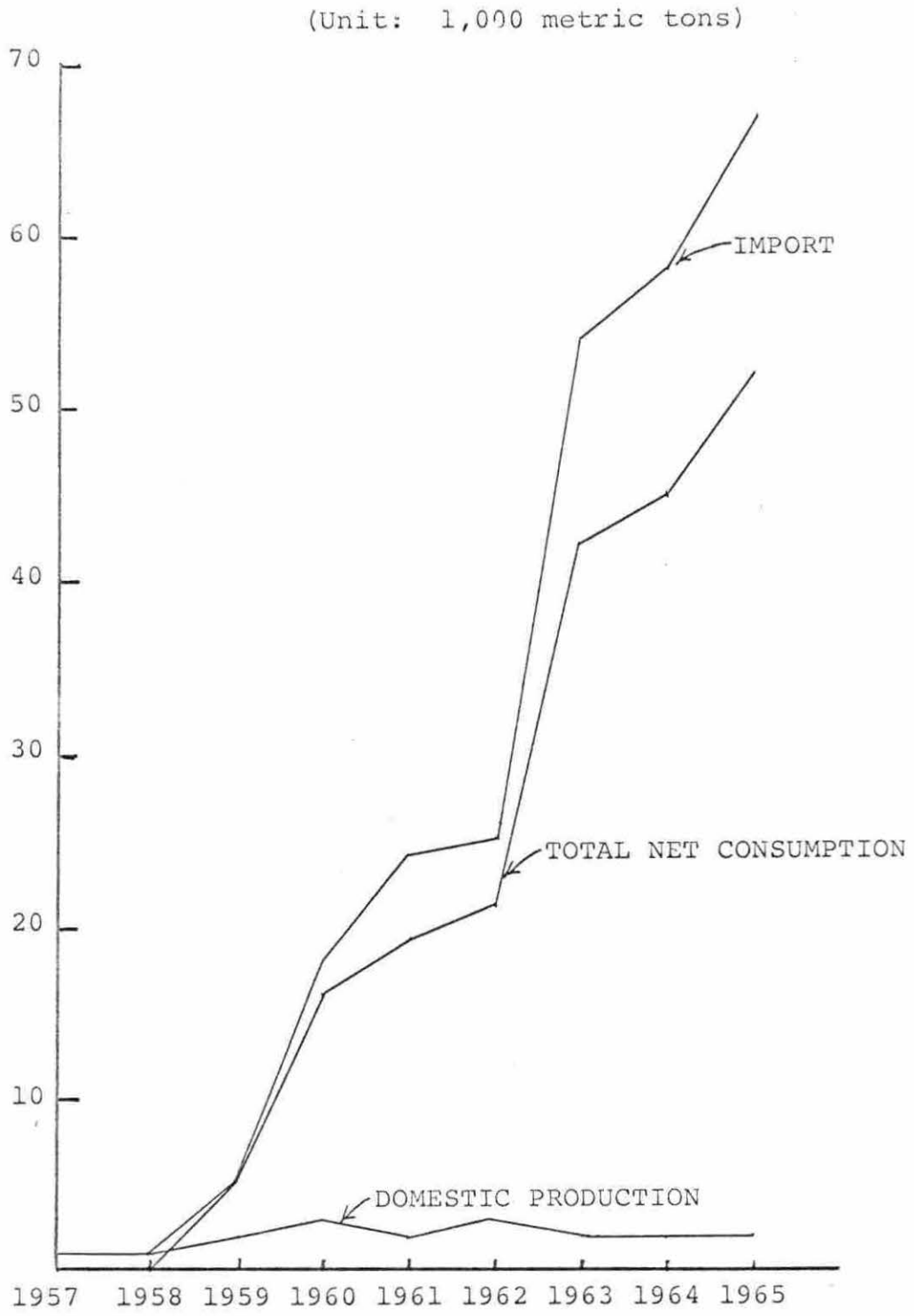

Figure 14. Goat and mutton (The diagram in drawn based on the data of Table 34)

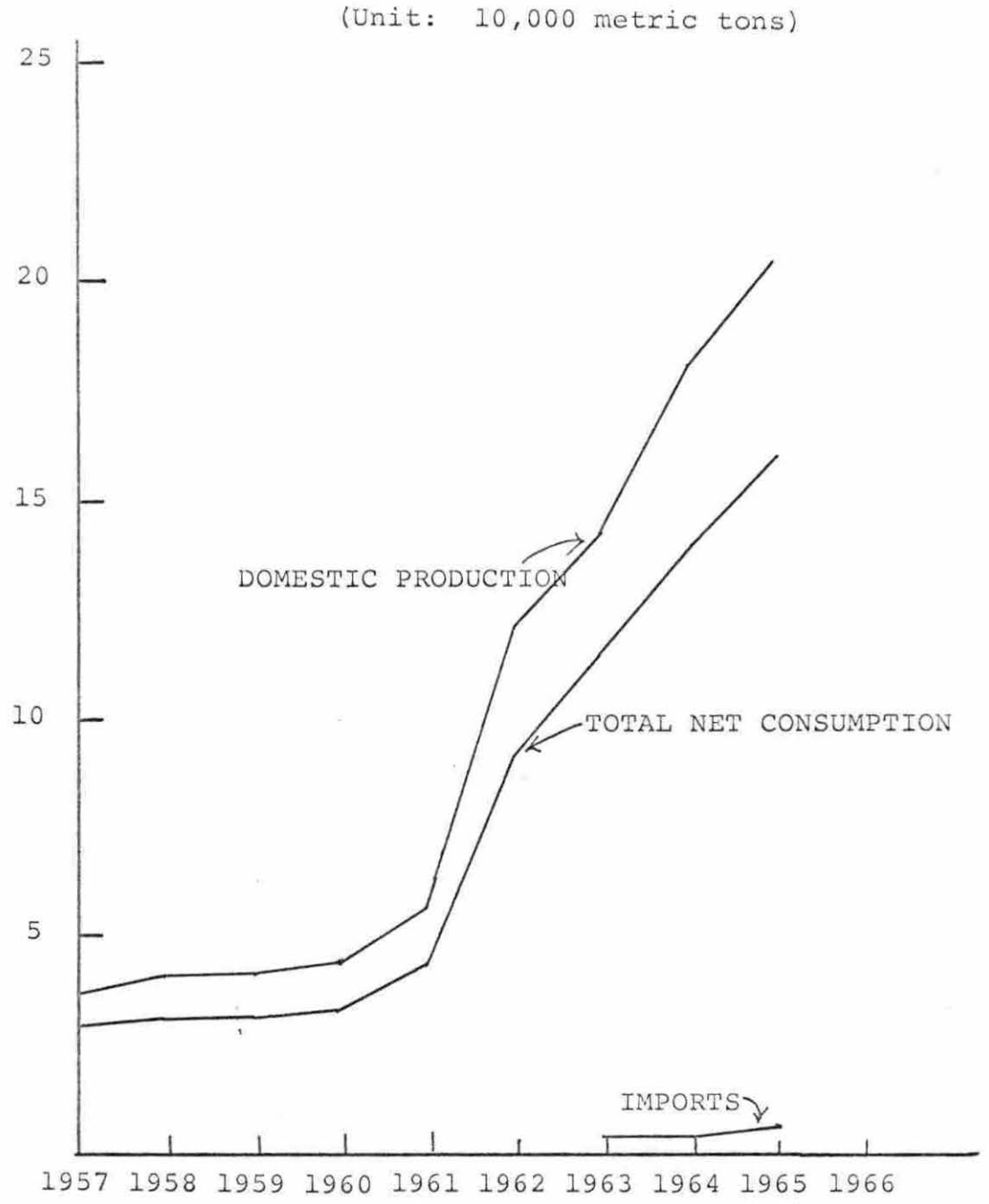

Figure 15. Chicken meat (The diagram is drawn based on the date of Table 34)

Table 37. Changes in production of milk and milk production*

(Unit: metric tons)

Year	Total Milk Production	Breakdown			Production of milk products					
		Drinking	Manufacturing	Others	Whole milk products		Skin milk products		Butter	Cheese
					Condensed	Powdered	Condensed	Powdered		
1951	437,699	178,071	228,258	34.370	21.730	12.180	--	841	2,702	274
1956	1,153.631	542.145	495.261	116.225	51.647	16.810	13.258	4.421	7.712	1.917
1957	1,361.640	617.938	611.606	132.096	58.726	21.426	17.759	7.006	9.585	2.900
1958	1,548.334	739.529	669.228	139.577	45.760	19.844	17.006	12.949	12.649	3.434
1959	1,714.900	856.640	700.205	158.055	47.390	25.036	20.632	11.318	11.912	4.311
1960	1,886.997	986.895	741.666	158.436	48.999	29.207	24.720	10.552	11.821	5.213
1961	2,113.537	1,105.197	844.519	163.821	53.315	34.566	28.955	11.691	13.214	6.661
1962	2,437.050	1,187.962	1,067.185	181.903	59.894	46.226	30.905	16.898	18.548	7.766
1963	2,761.250	1,396.753	1,173.150	191.347	54.494	52.148	28.858	25.220	22.422	11.926
1964	3,020.234	1,644.093	1,181.042	195.099	41.667	60.512	28.313	26.520	23.199	13.239
1965	3,428.100	1,762.500	1,253.500	212.100	40.206	75.941	25.038	24.531	23.975	15.332

*Source: (20)

Output of compound powdered milk (for infant feeding use) was up substantially because of increased demand for both export and domestic use. Factory output of condensed milk continues to decrease because of smaller demand. Both production of butter and cheese continues to increase sharply. The utilization of milk for butter and cheese production was 19.4% and 2.1% (8) in 1965 (domestic). Changes in the utilization of milk have resulted in the marketing of less canned condensed milk and more fluid milk powdered milk, cheese and butter.

2. Consumption of fresh milk and milk products

The consumption of fluid milk in 1965 was 1,762,500 metric tons, compared to 178,071 metric tons in 1951, an increase of about 9.8 times[a]. The proportion of fluid milk consumption to total milk production was approximately 54.6% in 1965 compared to 47 percent in 1951[a].

Fluid milk consumption in Japan is only 50 grams (20) per capita a day, but it is increasing year after year. The quantities of milk used for School Lunch Program are being increased. In 1966, it is expected that the 187.500 metric tons will be supplied to school children (20.) Imported skim milk powder is used for the program too, and it increased approximately from 30,000 to 50,000 metric tons (20) per year.

However, the consumption of milk and milk products expressed in fluid milk equivalents has increased faster than

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[a]Calculated from Table 37.

milk production, a widening of the gap to be filled by imports. The import-dependency rate increased from 11.2 percent in 1955 to 23.5 percent (36) in 1964. United States nonfat dry milk has accounted for a large part of the imports (Table 36).

Under the system of Japan's import laws, the items given automatic approval are natural cheese, milk casein and purified lactose. Other dairy products are controlled under import quota systems and only the Livestock Industry Promotion Corporation can import them.

D. Eggs

1. Egg consumption

Egg consumption has greatly increased in recent years because of the improvement in national diet which has been brought about by a rapid growth of Japan's economy.

Eggs moving into commercial channels was estimated to have accounted for 86 percent of the 18.6 billion eggs (20) produced in 1965. Per capita consumption of eggs was 8.8 kilograms per person, which compared with 8.6 in 1964, 4.8 in 1960, and 3.4 in 1955 (Table 20). Reportedly, in urban areas consumption of eggs in 1965 was 9.6 kilograms and this represents the level of consumption in Italy in 1963 (9).

According to a recent report the elasticity of demand for eggs has dropped to 1.0 or possibly slightly less in recent years, but prior to 1963 was estimated to be 1.5 or more.

Table 36. Japan's imports of nonfat dry milk, by principal country of origin 1953-1964*

(Unit: metric tons)

Year	United States	New Zealand	Australia	Others	Total
1953	1,034	0	260	367	1,661
1954	14,183	0	0	0	14,183
1955	14,926	0	0	0	14,926
1956	19,319	0	0	999	20,318
1957	24,949	1,457	0	0	26,406
1958	19,706	1,431	731	0	21,868
1959	18,800	0	0	1	18,801
1960	40,187	0	618	2,621	43,426
1961	29,471	308	906	614	31,299
1962	40,162	1,368	1,909	1,675	45,114
1963	65,118	2,596	456	0	68,170
1964	73,852	2,342	157	55	76,406

*Source: (22)

The inelastic demand for eggs would indicate that under present dietary habits, if a major increase in consumption is to take place, more westernization of diet will be necessary. This inelastic demand will, in likelihood, create a depressed market situation for eggs in years ahead if production expands as predicted.

2. Processing - storing of eggs.

a. Processing

About 12% of the total egg supply is used in the production of cake and mayonnaise, etc. (20). Recently mayonnaise production has been increasing at the rate of about 20 percent a year (20).

b. Storage

Several million eggs are kept in cold storage every year in the Tokyo-Yokohama area and in Kyoto-Osaka-Kobe area. In addition to this storage, mayonnaise makers keep eggs in cold storage to adjust mayonnaise production to the seasonal fluctuation of egg production. Such cold storage contributes in large measure to egg price stabilization.

VII. SLAUGHTER INDUSTRY IN JAPAN

A. Description of the Slaughter Industry

There are 830 slaughter houses in Japan, 18 of which are classified as meat markets (39). That is, wholesale markets of meat. According to the Japanese laws, no animals may be slaughtered for food except in a slaughter house where a veterinarian inspects every animal before slaughter.

The 18 meat markets are in big cities and operate in conjunction with the slaughter houses. In effect, they comprise the wholesale market for meat. Eighty of the 830 slaughter houses annually butcher at least 30,000 head of livestock each; the others, less.

Ten of the 18 meat markets are surveyed for quantity and price every day by a staff member of the Ministry of Agriculture and Forestry. The results are telegraphed to Tokyo daily and broadcast. This disseminates market information and permits price discovery throughout the country.

An additional 80 slaughter houses are surveyed daily for the number of animals slaughtered. From the total for the 80, taking into account historical relationships, total daily slaughter is estimated. The remaining 750 are surveyed once a month for the number slaughtered. The government uses the daily estimate of slaughter to determine whether the supply is deficient and if imports are required. On the other hand, if the price drops unduly, the government buys to support the price.

Each year a consulting board, together with the Ministry of Agriculture and Forestry, sets upper and lower limits as price policy guides[a].

B. Livestock Numbers Slaughtered Commercially and Production of Carcass Meat

The slaughter of livestock continued to increase considerably during the period of 1957-1965.

The total livestock numbers slaughtered commercially increased from 4,223 thousand head in 1957 to 8,395 thousand head in 1965, an increase of about 99 percent. The production of carcass meat increased from 282,805 metric tons in 1957 to 597,000 metric tons in 1965, an increase of about 75 percent. This indicates that the increasing rate of total livestock numbers slaughtered commercially is higher than that of production of carcass meat.

Hog slaughter rose very sharply during this period due to a large increase in hog numbers, particularly since 1962. The total hog numbers slaughtered increased from 2,673 thousand

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[a] "The law concerned with stabilization of prices of livestock products executed on December, 1961, is the law which was established for the purpose of preventing extreme fluctuations of prices of livestock products such as dairy products, pork, beef, etc., to aim at planned and stable development of livestock as an important part of emphasis on agriculture, and to improve the nation's standard of living by providing consumers with livestock products at stabilized prices. The basic framework of this law is a form of ceiling and floor prices. The products will be bought when the price is lower than stable floor prices. The products in stock will be channeled into the markets as well as imported from other lands when price is higher than the stable ceiling price. This adjustment work has been carried out by "The Improvement Association of Livestock in Japan."

head in 1957 to 6,700 thousand head in 1965, an increase of about 2.5 times while the production of carcass meat increased from 137,051 metric tons in 1957 to 358,000 metric tons in 1965, an increase of approximately 2.6 times.

The slaughter of cattle increased only moderately throughout this period (1957-1965). The slaughter of cattle had remained fairly constant other than from 1963 to 1965 while slaughter volume of calves had trended slightly upward during this period. In general, the production of carcass meat of cattle and calves has trended slightly upward.

Horse, sheep and goat numbers continued to decline rather sharply during this period (Table 24). The population of horses has been reduced sharply in recent years due to the substantial number of young horses being slaughtered for the processed meat industry.

Despite a rather sharp decline in horse, sheep and goat numbers in Japan, slaughter volumes remained fairly constant. Sheep and lamb slaughter dropped off sharply due to the heavy inflow of low-priced mutton from New Zealand.

Table 38 will show the trends of livestock numbers slaughtered commercially and production of carcass meat from 1957 to 1965. The trends in livestock slaughter prevailing in this period are expected to continue in the years ahead. In accordance with the general trend in cattle and calf numbers, beef production will probably decline slightly for the years ahead. The production of pork will increase but at a slower rate

Table 38. Livestock slaughter and meat production in Japan classified by kind

(Unit: 1,000 head for number slaughtered; metric tons for meat production)

	Cattle		Calves	
	Number	Production	Number	Production
1957	571	114,201	146	5,214
1958	608	121,724	167	5,887
1959	675	136,900	181	5,900
1960	668	137,403	165	5,048
1961	655	137,799	159	4,949
1962	657	140,101	187	6,024
1963	832	177,182	265	8,747
1964	1,001	214,468	289	9,460
1965	945	211,600	280	8,500

[a]Livestock population is not inclusive of chickens

*Sources: (1; 2; 3; 4; 5; 6; 7; and Table 19)

Table 38 (Continued)

Hogs		Horses		Sheep and lambs	
Number	Production	Number	Production	Number	Production
2,673	137,051	107	19,011	288	4,557
3,131	161,140	105	18,551	315	5,025
3,488	179,200	135	23,900	300	4,900
2,836	147,318	138	23,662	372	5,980
3,948	206,288	126	23,288	377	6,190
6,224	324,188	135	24,856	256	4,120
5,386	279,354	117	22,083	244	3,620
5,700	298,057	89	17,493	172	2,570
6,700	358,000	75	15,300	135	2,100

*Sources: (1; 2; 3; 4; 5; 6; 7; and Table 19)

Table 38 (Continued)

Goats and kids		Total livestock		Livestock[a] Population
Number	Production	Number	Production	(Unit: 1,000 head)
437	2,771	4,223	282,805	7,155
409	2,678	4,735	315,005	7,170
386	2,500	5,165	353,300	7,541
384	2,580	4,563	398,991	7,104
340	2,280	5,605	380,794	7,617
308	2,130	7,767	501,419	8,917
300	1,890	7,144	492,876	8,102
279	1,750	7,530	543,798	7,976
260	1,500	8,395	597,000	8,005

[a]Livestock population is not inclusive of chickens

than in the past. The production of mutton will probably decline according to the downward trends of goat and sheep in the recent years because of competition from imported mutton and wool.

VIII. ESTIMATION OF LIVESTOCK PRODUCTION, CONSUMPTION AND FEED STUFFS IN JAPAN

A number of sets of projections of livestock products for 1970, 1971, 1975 and 1976 have been developed in recent years to evaluate prospects for livestock products supply and demand in Japan. Three sets of projections of livestock products are used in this chapter to forecast the future level of livestock products.

First, the outlook of livestock industry in Japan developed by the Ministry of Agriculture and Forestry made in 1964 for projections to 1971 on the basic data of 1961.

Second, the estimation of livestock products with projections for 1970 and 1975 were developed by Professor Shinohara, Department of Agricultural Economics, University of Tokyo, in 1964.

Third, long-term outlook for livestock products: projections for 1976 were developed by the Ministry of Agriculture and Forestry, Tokyo, Japan, on the basic data of 1964.

A. The Outlook of Livestock Industry in Japan: Projection for 1971

In 1964 the Ministry of Agriculture and Forestry announced the outlook of the livestock industry. The basic data in the announcement were through 1961, and the projections were for 1971.

1. Estimations of demand for livestock products

Estimation of the demand for livestock products are given in Table 39. The estimation was conducted by means of "Long-Term Outlook for Demand and Supply of Agricultural Products" announced in May, 1962. The premises of the estimation may be summarized as follows (15):

a. Under present favorable conditions for Japan's economy, per capita national income is expected to be continued to increase to higher standards.

b. The outlook of the demand for livestock products in 1971 was based upon the assumption that Japan's economic rate of growth would be 7.0%, 7.8% and 8.7%, along with the coefficients of income elasticities for milk, meats and eggs of 1.7, 1.3 and.1.0 respectively, which were calculated by using past consumption trends.

Table 39 shows that the demand for milk and milk products, meat and eggs in 1971 are estimated to increase to 750-960, 114-145, and 107-129 thousand tons. Compared to the consumption in 1961, this is an increase of 3.2-4.4 times for milk and milk products, 2.4-3.1 times for meats, and 1.5-1.8 times for eggs. Per capita consumption of livestock products in 1971 will be 64.6-88.1 kilograms, 8.5-10.9 kilograms for meats, and 8.7-10.5 kilograms for eggs. From these consumption figures, we can imagine that the consumption level in Japan by that

Table 39. Projection of the demand and supply for livestock products*

(Unit: thousand metric tons)

	1961	1971		
		Demand	Supply	
	Consumption	Long-term outlook	Long-term outlook	Long-term planning for livestock
Milk and milk products	2,180	a. 7,054 b. 8,161 c. 9,595	5,913	8,160
Meats	471	a. 1,138 b. 1,276 c. 1,451	1,022	1,237
Eggs	727	a. 1,069 b. 1,169 c. 1,290	1,225	1,220

Notice: The demands of long-term outlook, a, b, and c, refer to economic rates of growth of 7.0%, 7.8% and 8.7%, respectively.

*Source: (15)

time will be very close to some of the western European countries, particularly Italy's.

2. Estimation of the supply for livestock products.

As shown on Table 39, the supply for milk and milk products, meat and eggs in 1971 are estimated to reach 5,913 thousand metric tons for milk and milk products, 1,022 thousand metric tons for meat and 1,225 thousand metric tons for eggs. deficits between demand and supply will need to be imported.

3. Estimation of livestock population.

In order to meet the supply shown on Table 39, it is necessary to achieve progress toward large-scale operation, the spread of modern techniques and an increase in the production of feed crops and fodder. For this purpose the, "Domestic Animal Improvement and Propagation Law" was set up in 1961. The estimation of livestock numbers needed to meet production needs in the future was based on this law are shown in Table 40.

4. Estimation of the demand for feed stuffs.

Further expansion and development of the Japanese livestock numbers will require a corresponding increase in feed supplies. In order to feed the livestock number shown on Table 41, it would be useful to calculate the amount of feed stuffs required. The demand of feeds in 1971 is expected to reach an

Table 40. Estimation of livestock numbers in Japan*

(Unit: 1,000 head)

	1961	1963	1971
Dairy cattle	885	1,145	2,900
Draft cattle	2,313	2,337	2,500
Total cattle	3,198	3,482	5,400
Horses	618	471	500
Swine	2,604	3,296	7,400
Sheep	677	388	700
Goats	520	464	500
Chickens	71,806	98,447	150,000
Hen chickens	71,516	97,743	120,000
Broilers	290	704	30,000

*Source: (15)

amount of 22,834 thousand metric tons in T.D.N., it is about 1.5 times compared with 14,830 thousand M/T in T.D.N. in 1964.

Table 41 shows the trends of the outlook for demand for feeds in 1971 compared with in 1964.

5. Estimation of the supply for feed stuffs

The outlook of the supply of roughage feeds in 1971 is expected to reach 10,466 thousand M/T in T.D.N. In order to meet this required supply, the government is expected to promote grassland improvement work of 500 thousand hectares (including possible feeds supply area estimates of 440 thousand hectares). This is 3.3 times the 135 thousand hectares devoted to feed production in 1964 (15). Arable lands planted to grass and forage crops is expected to reach 1,000 thousand hectares

Table 41. Estimations of the demand and the supply of feeds in Japan*

(Unit: 1,000 metric tons)

Classification			1964 (plan) The amount in T.D.N.	1964 (plan) Actual amount	1971 The amount in T.D.N.	1971 Actual amount
		Demand	14,833		22,834	
		Roughage feeds	6,282		10,446	
Supply	Concentrated feeds	Domestic	4,386	6,248	5,947	8,383
		imports	4,165	5,396	6,421	8,200
		Total	8,551	11,644	12,368	16,583
		Total	14,833		22,834	
Domestic supply rate			72%		72%	

*Source: (15)

in 1971, an increase of about 1.9 times over 1964 planting of 520 thousand hectares.

On the other hand, the domestic production of concentrated feeds in 1964 was 4,386 thousand metric tons in T.D.N., it is expected to increase to 5,947 thousand metric tons in T.D.N. The balance between total demand, 22,834 thousand metric tons in T.D.N. and total supply, 16,410 thousand M/T in T.D.N. is 6,420 thousand metric tons in T.D.N. which is expected to be imported. When 6,420 thousand metric tons in T.D.N. is converted to actual concentrates it is approximately 8,200 thousand metric tons an increase of around 52 percent when compared to 5,400 thousand metric tons in 1964. The domestic supply rate of feeds in 1964 and 1971 are estimated to be 72 percent.

Table 41 shows the trends of the supply of feeds in 1964 and 1971.

B. Estimation of Livestock Products: Projections for 1970 and 1975

Large increases in demands are expected for livestock products. According to the estimates reached in the survey conducted by Professor Shinohara, Department of Agricultural Economics, University of Tokyo, in 1964, the demands, domestic supplies and demands for imports of livestock in 1970 and 1975 are forecast as the following:

1. Projection of livestock population

The future livestock population is estimated to increase by the following percentages each year: 10% (to 1970) and 8% (after 1970) for dairy cattle; 10.6% for swine; 7% for chickens and draft animals; beef cattle and other types of livestock are expected to maintain present levels or decline. For this reason, the shares of feed used for dairy cattle and swine are estimated to increase annually.

Projections of future livestock numbers (existing stock plus the number of new calves in the year as of February 1 in the years of estimation) are shown in Table 42.

Table 42. Projection of the livestock population in Japan*

(Unit: 1.000 head)

	1970		1975	
	'70.2.1.	Number fed during a year	'75.2.1.	Number fed during a year
Dairy cattle	2,238	2,351	3,277	3,408
Draft and beef cattle[a]	2,382	2,394	2,542	2,565
Horse	378	372	293	285
Sheep	666	673	735	743
Goat	298	289	218	212
Swine	6,174		10,217	
Breeding heads		895		1,481
Feeder pigs		6,088		10,074
Chickens	114,521		141,096	
Laying hens		99,519		122,612
Pullets		48,328		59,543
Cockerels		11,567		14,251
Broilers	7,166	7,452	54,417	56,588

[a] In official statistics beef and draft cattle are not separated.

* Source: (32)

2. Projection of demand, domestic supply and imports of livestock products (see Table 43 to Table 51).

The procedures used by Professor Shinohara (32) to estimate the levels of demand, supply and imports for livestock products are presented as follows:

a. The level of demand is estimated by taking into consideration the influences of future population, income and other relevant factors, including consideration of past trends.

b. Assuming constant price levels, the estimates of demand and supply (domestic production and imports) are conducted separately.

c. The estimation of domestic production is conducted mainly on the basis of past trends and, in most cases, the influence of price is given little consideration.

d. The demand for imports is simply shown as the balance after subtracting domestic supply from the estimated demand level.

C. Long-Term Outlook for Livestock Products: Projections for 1976

"A Long-range Outlook for Agricultural Products in Japan," published by the Ministry of Agriculture and Forestry Projects, livestock products for 1976.

1. The projections for beef in 1976 are as follows

Table 43. Projection of livestock produce in Japan*

(Unit: 1,000 metric ton)

	1970	1971	1971[a]	1975
Milk	5,537	6,096	5,913	7,786
Eggs	1,077	1,155	1,225	1,330
Beef	185	194	189	236
Pork	532	589	592	881
Chicken	195	222	223	438
Other meat[b]	16	15	18	14
Total of meat	928	1,020	1,022	1,569

Notice: Production of meat is measured in terms of carcass weight.

[a]Government Official figures on "Long-term Projection of the Demand for and Supply of Agricultural Products."

[b]Including horse meat, mutton, goat meat.

*Source: (32)

Table 44. Estimation of demand, domestic supply and imports of meats and eggs in 1970 and 1975*

(Unit: 1,000 metric ton)

	Demand	Domestic supply	Imports
1970			
Beef	316	185	131
Pork	547	532	15
Chicken	166	195	-29
Mutton	114	16	98
Eggs	1,003	1,077	-74
1975			
Beef	467	236	231
Pork	1,028	881	147
Chicken	297	438	-141
Mutton	231	34	217
Eggs	1,387	1,330	57

*Source: (32)

Table 45. Relation between demand and supply of milk in 1975

(Unit: 1,000 metric ton)

	Total demand		Total	Net import	
	1955 Price (1)	1960 Price (2)	Supply (3)	(1)-(3)	(2)-(3)
Total	9,828	9,891	7,786	2,042	2,105
For drinking	6,299	6,538	--	--	--
For processing	3,529	3,353	--	--	--

*Source: (32)

Table 47. Per capita consumption estimated with 1955 prices, part II.*

Dairy products	1970	1975
Value	4,298 yen	5,997 yen
Quantity	67,312g	92,613g
Calories	108.0 cal.	149.7 cal.
Protein	5.5g	7.6g
Fat	5.9g	--

Note: Value and quantity are measured in per person per year, and nutrition components in per person per day. g: gram.

*Source: (32)

Table 46. Per capita consumption estimated with 1955 prices, part I*

	1970	1975
Milk	42,585g (227 bottles)	59,365g (317 bottles)
Butter	10,870 (392g)	13,151 (475g)
Cheese	5,788 (544g)	11,299 (1,063g)
Powdered milk	4,373 (684g)	4,908 (767g)
Condensed milk	3,696 (1,296g)	3,890 (1,365g)

Note: The figures in the left side of each column are shown in units of raw milk, and the figures in parenthesis in the unit of each item. Milk is measured in a 0.18 liter bottle. g=grams.

*Source: (32)

Table 49. Demand function for diary products as a whole*

Items	Equations	R^2
Value	$Q = -1.284 + 1.577Y - 1.744P$	0.984
Quantity	$Q = 0.508 + 1.429Y - 1.677P$	0.984

*Source: (32)

Table 48. Equations for estimating demand for dairy products in 1970 and 1975*

Items	Equations	R^2
Total quantity of dairy products	$Q = 0.508 + 1.429Y - 1.677P$	0.984
Milk	$Q = -5.051 + 2.096Y - 1.165P$	0.977
Butter	$Q = 0.558 + 1.761Y - 0.881P_B - 1.969P_R$	0.979
Cheese	$Q = -11.314 + 3.336Y - 1.113P$	0.986
Powdered milk	$Q = 4.864 + 1.289Y - 3.268P$	0.930
Condensed milk	$Q = 2.619 + 1.083Y - 1.336P$	0.853

Note: Q indicates per capita consumption per year, Y per capita real income per year and P price of each item relative to the consumer's price index. All variables are logarithmic. The period when the equations were calculated is 1951 to 1960. P_B shows price of butter and P_R price of bread relative to price of rice. P_B and P_R means complementary.

*Source: (32)

Note: (1) Q, Y and P, which are seen in the following equations, indicate respectively per capita quantity, per capita real income and price of each item relative to the consumer's price index.

(2) Refer to the Notes of each Table about subscripts of notations.

(3) The data adopted here are explained in the article.

(4) The period for which the equations are calculated is 1951 to 1960.

Table 50. Demand function for meats, milk and eggs*

Items	Equations	R^2
Value	$Q = 1.781 + 1.283Y - 2.252P$	0.968
Calorie	$Q = 1.875 + 1.307Y - 1.942P$	0.989
Protein	$Q = 0.298 - 1.397Y - 1.918P$	0.993
Fat	$Q = 0.763 + 1.267Y - 1.926P$	0.989

*Source: (32)

Table 51. Demand function for dairy products by commodities

Items	Equations	R^2
Milk	$Q = -5.051 + 2.096Y - 1.165P$	0.977
Butter (1)	$Q = 2.461 + 0.819Y - 1.366P_B$	0.966
Butter (2)	$Q = 0.558 + 1.761Y - 0.881P_B - 1.969P_R$	0.979
Cheese	$Q = -11.314 + 3.336Y - 1.113P$	0.986
Powdered milk	$Q = 4.864 + 1.289Y - 3.268P$	0.930
Condensed milk	$Q = 2.619 + 1.083Y - 1.336P$	0.853

Note: P_B and P_R indicate the price of butter and the price of bread relative to the price of rice, which is complementary to butter. For milk and butter, there are high correlations between Y and P, hence, the equations are calculated under the assumption of Y = P (is constant).

*Source: (32)

Beef production (dressed carcass) from beef-type animals is forecast at 180,000 metric tons for 1976. Yield of carcass beef per head is expected to increase to 250 kilograms per head, up from a 217-kilogram average in 1965. Efforts will be made to expand dairy herds, and in 1976 plans are to obtain 225,000 metric tons of beef from dairy bulls and herd bulls. Farmers are expected to feed dairy bulls for up to 18 months rather than slaughter them soon after birth. Total domestic beef supplies in 1976 are forecast at 405,000 metric tons, up from 206,912 metric tons in 1965.

2. The projections for pork in 1976 are as follows

Hog numbers will increase to 10,034,000 head by 1976. Imported breeds will result in an increase in average carcass weights (higher dressing percentage).

Pork production will total 880,000 metric tons in 1976, up sharply from the 407,238 metric tons produced in 1965. Hog production will cease to be a side-line enterprise and will be handled by large-scale operators in integrated operations.

3. The outlook for poultry meat production

In 1976 is estimated at 550,000 metric tons. This compares with 205,000 metric tons in 1965.

4. The outlook for all meats in 1976 is as follows

The demand for individual meats -- beef, pork, chicken, Lamb

and mutton -- was not forecast on an item basis. However, a total demand of between 1,990,000 and 2,318,000 metric tons was forecast for 1976. Domestic production was estimated at 1,842,000 metric tons including all meats, leaving a deficit of 148,000 to 476,000 metric tons to be imported.

The comments on this projection for 1976 made by the Agricultural Attache, the American Embassy in Tokyo, Japan, are as follows:

The pork production forecast may be too low. Poultry meat production also is estimated too low. The demand for all meats also appears too low, particularly in view of the rather sharp increase in 1966. Indications are that the demand for meat and production of meat probably will be somewhat above the predicted levels.

Imports of meat are expected to be mainly beef and low-quality meats for processing. Demand for beef, even at high prices, is fairly good; and with any reasonable reduction in prices, beef consumption would probably increase rapidly. Consequently, demand will depend upon the volume imported because imports are used to control prices.

IX. CONCLUSION

The livestock-meat industry in Japan is rapidly growing and is expected to play the most important role in the expansion of Japanese agriculture. The structure of livestock-raising in Japan has drastically changed since World War II. That is, the number of dairy cattle, swine and poultry has been increasing and the number of beef cattle, goats, sheep and draft horses has been decreasing.

Continual change in the Japanese diet, particularly among the youth, has brought increased consumption of meats, breads, poultry and dairy products, leading to increasing requirement for feed grains and tallow. As a result, Japan today is the leading buyer of U.S. agricultural products, purchasing almost a billion dollars a year.

The volume of feed consumption in Japan has been increasing in line with the growth of the livestock-meat industry. This increase is, of course, affected by the structural change in the livestock-meat industry in Japan. And as it is still at a changeable stage, forecasting is difficult. The changes in the consumption of meats, poultry and dairy products is affected by changes in the population and its age distribution, consumers' income, and relative prices of meat and meat products, other important factors are changing tastes which are related to the degree of urbanization and westernization.

Japan's feed situation is characterized by an increase in the consumption of concentrate feeds, especially, mixed feeds. Most of the ingredients for the mixed feeds are imported. Further expansion and development of the Japanese livestock industry will require a corresponding increase in imported feed supplies. It is expected that at least two-thirds of Japan's feed requirement will be met by imports from the U.S.A., Thailand, communist China, Argentine and South Africa[a]. Current estimates for the livestock industry in Japan indicate a continued growth in order to meet the increased demand for meats, poultry and dairy products for the next 10 years[b].

As described in the preceding chapter, the comparison of the projections by Professor Shinahara and the Japanese Ministry of Agriculture and Forestry was made. It seems that they both are projecting the production of meats, poultry and dairy products in Japan will keep up fairly well with that of demand. They expect domestic feed production to be shorter than domestic demand. Hence, increasing imports of feed and no appreciable increase in imports of meats are

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[a]Mr. Shohachi Suzuki, Assistant Director, Commercial Feed Section, Livestock Bureau, Japanese Ministry of Agriculture and Forestry (one member of the Far East Feed Study Team to the U.S. June 15 to July 6, 1968). Private interview, June 25, 1968.

[b]Mr. Katsu Yamanaka, Executive manager, Japan Feed Council, Tokyo, Japan (Deputy leader of the Far East Feed Study Team to the U.S. June 15 to July 6, 1968). Private interview, June 20, 1968.

expected. The reasons preferring imports of feed rather than increase in imports of meats can be summarized as follows: (1) under the present system of Japan's import laws, dairy products are controlled under the import quota systems and only the Livestock Industry Promotion Agency can import them. Meats are imported only if the domestic supply of meats is shorter than that of demand after importing feed[a]. (2) imports of feed to produce meat is the logical way to the development of the Japanese livestock-meat industry[b] under the present livestock conditions. (3) when production costs and consumers' price are considered, it will be beneficial for both consumers and producers if feed is imported to produce meats[c].

The past policies of the Japanese Ministry of Agriculture and Forestry have clearly been to discourage meat imports and to encourage the importation of feed grain and other ingredients. If Japan imports meat, it will probably consist of

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[a]Mr. Terashi Suzuki, Assistant Manager, Research and Development Department, Chufu Feed Manufacturing Corporation, Nagoya, Japan (one member of the Far East Feed Study Team to the U.S. June 15 to July 6, 1968). Private interview. June 25, 1968.

[b]Mr. Toshio Minagaw, Director for Feed and General Affairs, U.S. Feed Grains Council, Tokyo, Japan (one of the escorts of the Far East Feed Study Team to the U.S. June 15 to July 6, 1968). Private interview. June 20, 1968.

[c]Mr. Harunobu Noro, Chief of Technical Section, Japan Scientific Feed Association, Tokyo, Japan (one member of the Far East Feed Study Team to the U.S. June 15 to July 6, 1968). Private interview. June 29, 1968.

small amounts to meet temporary unbalances of supply and demand. This policy has been dedicated to the development of the domestic livestock-meat industry. This is consistent with their overall goal of economic growth and industrial development. It seems that there is no reason to expect this policy to change for at least ten years.

The livestock improvement program has relied heavily on importations of breeding stock since World War II. This is one of the important factors contributing to the development of the livestock-meat industry in Japan. In order to continue the improvement of meat quality and feed utilization, this program probably will be and should be continued.

The higher a country's standard of living in terms of per capita income, the more red meats it consumes per capita. Within individual countries a rise in per capita income and a rise in per capita meat consumption usually are directly related.

Generally as living standards improve, consumption of meat and other animal products increase at the expense of cereal grains and other non-animal food products. At very low income levels and during the first stages of rising incomes, consumption of all broad categories of food increase rapidly and in about the same proportion. However, after this first stage, consumption of meat increases proportionately more than other foods. After meat consumption reaches very high levels, as in the United States, Argentina, and

Australia, the effects of rising income on increased consumption is considerably lessened. Australia and Argentina are two countries where meat prices are unusually low and per capita meat consumption is very large even though income levels are not as high as in some other countries.

Most Japanese officials think that livestock consumption will continue to increase in light of the growing livestock industry and of the government's efforts to increase the production and consumption of red meat and poultry. Japan is also a nation with rapidly increasing personal incomes, and if Japan follows the path of other advanced nations, meat and poultry consumption will increase at the expense of staple foods. This raises an interesting question of how much further the livestock industry will go in light of the fact that rice continues to be the preferred cereal. This question is broader, of course, than just purchasing power consideration since it involves such things as customs, attitudes, scale of values, and the educational level of the people.

Modern Japan is in a position to provide some answers to this question. Per capita income is now at a level where consumers can afford other foods, and the Japanese people have demonstrated an eagerness to try "the new and the different" generally. But more time and analysis will be required for an answer as to what extent and at what speed an affluent Asian people -- long accustomed to eating rice --

will abandon a tradition of building the meal around one product.

Under the assumption that the present growth will continue in the population and consumer incomes, the present rising domestic output of livestock and poultry products will continue as long as the level of demand in Japan is below that of western countries.

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